



Are Electric Vehicles Expensive to Maintain? Taking a Closer Look at the Cost of EV Maintenance

Technology Innovation Spotlight

Recent news has indicated that Electric Vehicles (EVs) have much higher maintenance and repair costs than conventional vehicles. Analysis performed by EPRI indicates that although there have been some eye-popping repair bills for some EVs, these have generally been due to factors unrelated to powertrain type. The difference between routine maintenance and unexpected repairs of a vehicle becomes important to identify when analyzing costs that customers should expect. The intricate relationships among vehicle design, availability of repair components, and the overall expenses of EV ownership—versus those of a conventional gasoline vehicle—are summarized below. Three key insights offer a nuanced understanding of EV costs, including the distinction between maintenance and repair costs, the importance of comparing similar vehicle categories, and the effects of design and assembly decisions on maintenance expenses.

Key Takeaways

- While repair costs may be higher than average for certain EV models, it is safe to say it costs less overall to maintain an electric vehicle than it does a comparable gasoline vehicle.
- High repair costs in any vehicle can result from modern car design, which makes certain types of repairs more complex. Shortage of spare parts and a sparse network of repair shops can add to the problem.

What to Make of Any Cost Analysis?

1. Distinguish between maintenance costs and repair costs

Maintenance costs cover the routine services and component replacements that ensure a vehicle's continuing performance, such as critical fluids, 12V battery maintenance, brake-pad replacements, tires, windshield wipers, and general servicing. As Figure 1 shows, the estimated scheduled light-duty vehicle (LDV) maintenance cost for a battery-electric vehicle (BEV) is lower than that of one with a conventional internal combustion engine (ICE). This is because EVs lack such components as a transmission, timing belts, oxygen sensors, spark plugs, and other devices required in an internal combustion engine vehicle.

Repair costs, on the other hand, involve addressing failures or damages, which can include component replace-

Scheduled LDV Maintenance Costs

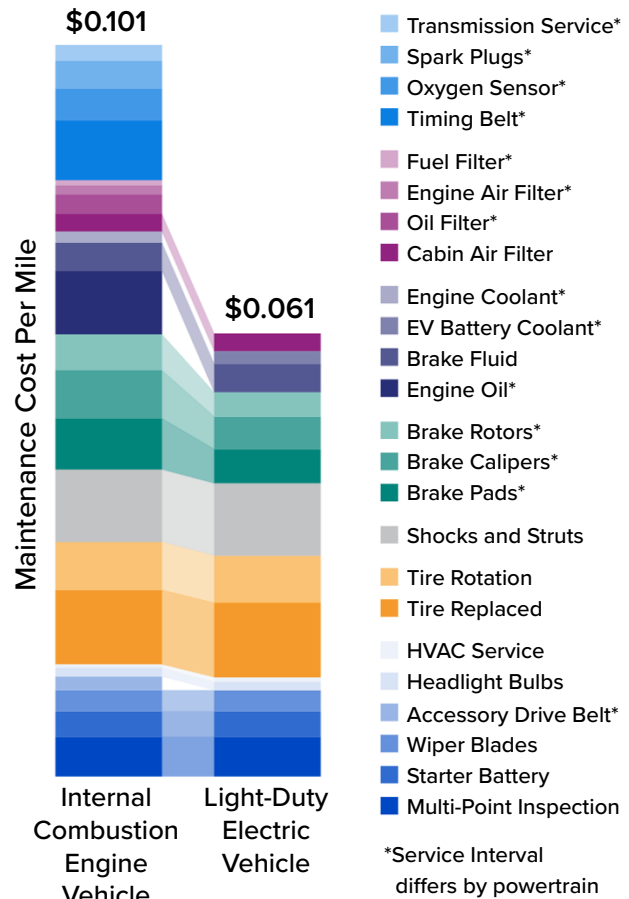


Figure 1. Scheduled Maintenance Costs [1]

ments due to crashes, malfunctions, or wear and tear. It's important to distinguish between these two types of costs, as maintenance costs are more predictable and are affected by the specific vehicle, while repair costs can be more variable and affected by factors like crashes or component failures.

2. Compare apples to apples!

To accurately assess the maintenance costs of electric vehicles, it is important to compare them to similar vehicles in the ICE category. This means comparing luxury electric vehicles to luxury ICE vehicles, as maintenance and repair costs can significantly differ based on the vehicle's

class, complexity, and included features. For instance, the average collision losses for Rivian pickups and SUVs are currently 47 percent higher than those for the average internal combustion engine (ICE) pickup. However, Rivian's price point, technology and luxury features align more with vehicles like the Range Rover than traditional pickup trucks. Remarkably, Rivian's collision losses are comparable to, or even lower than, vehicles such as the Audi Q7, and significantly below luxury SUVs from brands like Range Rover and Porsche, or the Mercedes G-Class [2]. It is important to note that while this may be true for EVs in the luxury segment, a recent analysis by Highway Loss Data Institute (HLDI) on models offering both electric and gasoline versions calculated that the electric variants are just 2% more to repair [3].

3. Understand the effects of design and assembly decisions

In some cases, electric vehicles may exhibit design specifics or use components that are prone to fail, contributing to higher maintenance cost or repair expenses. The root cause behind increased maintenance and repair costs isn't necessarily the EV-specific motors and batteries, but rather the transformation of the modern vehicle fleet into more complex and luxurious models—with EVs often at the leading edge of that change. Companies like Tesla have acknowledged the impact of advanced or complicated design on the repair costs of their cars. And yet, according to research conducted by HLDI, an ICE car is three times more likely to be totaled after a crash as a comparable electric vehicle [2]. Furthermore, the availability of convenient repair centers and collision shops plays a significant role in repair costs and ease of obtaining necessary services. For example, it is more convenient to access the network of an established player such as Ford versus that of a start-up that might just have 100 locations across the U.S.

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SOME FINER DETAILS TO THINK ABOUT

New Models and Reliability Concerns: Similar to ICE vehicles, newer electric vehicles often come with advanced features and technologies. However, these cutting-edge features might be less thoroughly tested, leading to potential reliability issues in early versions. This can raise maintenance costs if early models require more frequent servicing or repairs.

Resale Value: Compared to conventional vehicles, EVs often have higher salvage or resale value, especially due to valuable components like batteries. This shift affects the total loss equation, impacting insurance considerations and potentially offering better value for salvaged or wrecked EVs compared to their internal combustion counterparts. During 2019 auctions, the average price paid for a damaged Model 3 stood at close to \$18,000, significantly higher than the \$8,450 for a typical midsize luxury sedan. Similarly, the average salvage value for a Model S was around \$21,000, considerably surpassing the \$12,000 average for a standard car [2].

Scrapping Costs, Battery Value, and Total Loss Likelihood: The scrapping cost for electric vehicles tends to be higher due to the complexity of their components, especially the battery. However, the batteries within scrapped EVs retain considerable value—for repurposing or recycling for their basic metals—which can potentially offset some of the scrapping expense. Also worthy of note: Gasoline cars are three times more likely to be declared total losses after a crash compared to a Tesla and other electric vehicles, as per findings from the Highway Loss Data Institute (HLDI). Specifically, internal combustion engine (ICE) models were written off in 18.4 percent of collisions, while EVs accounted for only 6.1 percent in such cases [2].

References

1. [Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains](#). Energy Systems Division. (n.d.).
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3. [Insurance losses of electric vehicles and their conventional counterparts while adjusting for mileage](#). (n.d.).

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