

# Examining **total** **cost of ownership:** electric vs internal combustion engine vehicles

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Electric vehicles (EVs) are gaining immense popularity, no longer confined to early tech enthusiasts but captivating a much broader audience and swiftly transforming the landscape of the automotive industry.

The surge in electric vehicle (EV) popularity is driven by two pivotal factors: the introduction of numerous new EV models and the growing affordability of electric driving. Ayvens' Mobility Guide 2023 highlights that, notably in many European countries, EVs are not only gaining favour but are also proving to be more cost-effective to drive than traditional internal combustion engine (ICE) vehicles.

However, this positive momentum is nuanced by the gradual phase-out of EV taxation benefits. As leading countries decrease governmental subsidies for electric vehicles, it creates a dual-edged scenario. On one hand, this signals the achievement of a crucial turning point in EV adoption but on the other hand, it presents a short-term challenge by elevating the total cost of ownership of battery electric vehicles (BEVs), requiring careful consideration of the evolving electric mobility landscape.



**The crucial question emerges: what is the comparative cost of operating an EV versus a similar ICE model, and where are the cost differences? Within this white paper, we analyse the total cost of ownership (TCO) to compare the differences in cost elements between EVs and ICE vehicles.**

# Decoding total cost of ownership: exploring the cost

To compare the total cost of ownership (TCO) for both conventional internal combustion engine (ICE) vehicles and electric vehicles (EVs) it's important to have the same set of services for both powertrains. Within an operational lease contract, the main services included are:

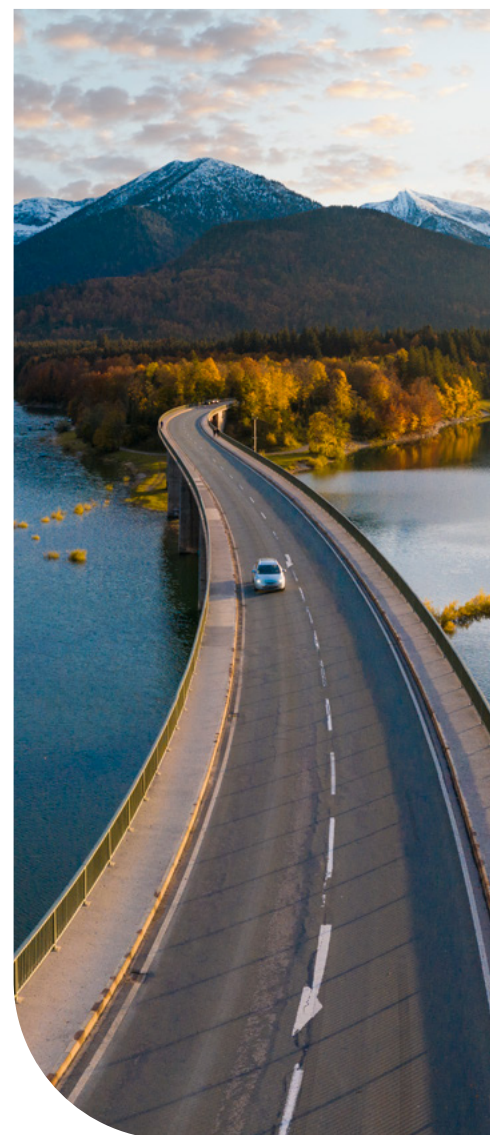
- **Funding**
- **Taxes**
- **Maintenance**
- **Tyres** (including summer and winter, if applicable)
- **Insurance** (comprehensive coverage)
- **Energy budget**, either fuel or electricity

The energy budget is one of the most significant cost factors acting as a pivotal cost differentiator, mainly due to the notably lower cost of electricity compared to traditional fossil fuels. Ensuring a genuine like-for-like TCO comparison means the cost of fuel and electricity must be included.

Electricity prices can vary more significantly across regions and countries compared to the prices of petrol and diesel. For example, rapid charging stations along highways are normally much more expensive than charging at home. Our data-driven approach uses a mix of 60% home charging, 30% workplace charging, and 10% public charging done by our clients, and guides our TCO calculations by incorporating average prices from these charging scenarios.

Beyond the scope of the cost elements, the TCO analysis uses a specific lease mileage and contract duration to determine the costs. For the purposes of this analysis, we adopt a standardised contract duration of 48 months and mileage of 120,000 km. This choice aligns with a common industry practice driven by the optimal balance between decreasing depreciation and increasing maintenance costs over time.

As a forward-looking initiative, it's worth noting that advancements in EV technology and charging infrastructure may introduce additional variables in future TCO assessments. Continued monitoring and adaptation of these factors will be crucial for staying abreast of the evolving electric mobility landscape.



## A thorough examination of BEVs vs. ICEs in 16 countries

To ensure a fair and comprehensive comparison between battery electric vehicles (BEVs) and internal combustion engine (ICE) vehicles, it is vital to evaluate comparable models. In this study, we undertake a comparative analysis between the top representative ICE models in each market (a selection of both petrol and diesel vehicles) and a basket of representative battery electric vehicles (only fully electric versions).

Leasing costs for these vehicles differ across countries and the lease price is influenced by factors such as local taxation, labour costs, fuel expenditures, and governmental incentives for EVs. Additionally, country-specific demand plays a role in shaping the initial vehicle sale price and its resale value. This study aims to offer a nuanced and comprehensive perspective by studying the average leasing costs for ICEs versus BEVs across 16 European countries.

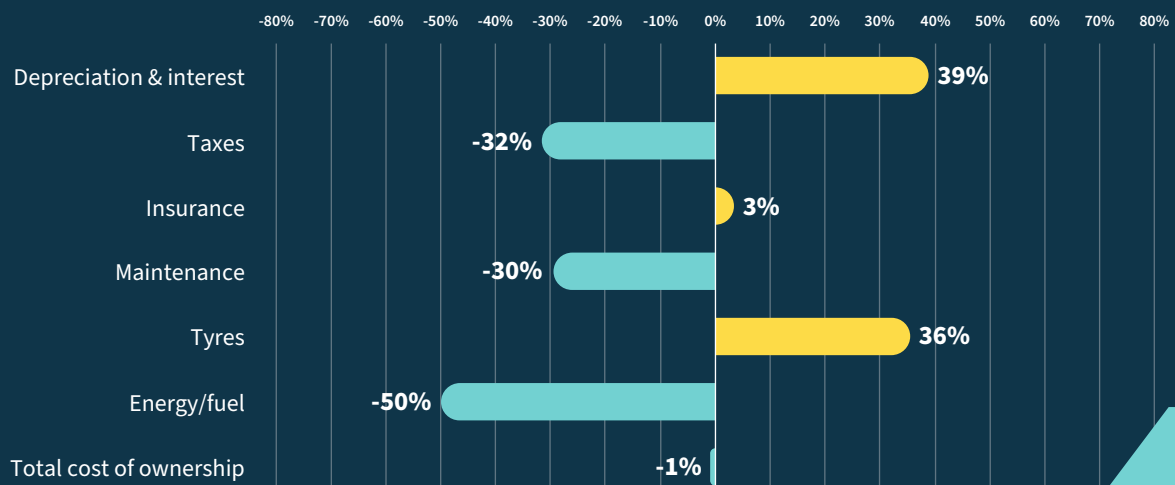


# Dissecting specific cost components in electric vehicles versus internal combustion engine vehicles

When analysing the overall total costs of ownership (TCOs) between battery electric vehicles (BEVs) and internal combustion engine (ICE) vehicles there are clear differences in the cost components. While BEVs generally have higher costs in areas such as depreciation and interest, they often benefit from favourable tax rates and have overall better cost efficiency in maintenance than ICE vehicles.

These comparisons, however, vary significantly on a country level. In countries with higher EV readiness, the TCO for BEVs can be substantially more beneficial than in less mature markets, shaping a diverse landscape in the adoption and economic feasibility of BEVs globally.

## Difference in BEV cost compared to ICE vehicles

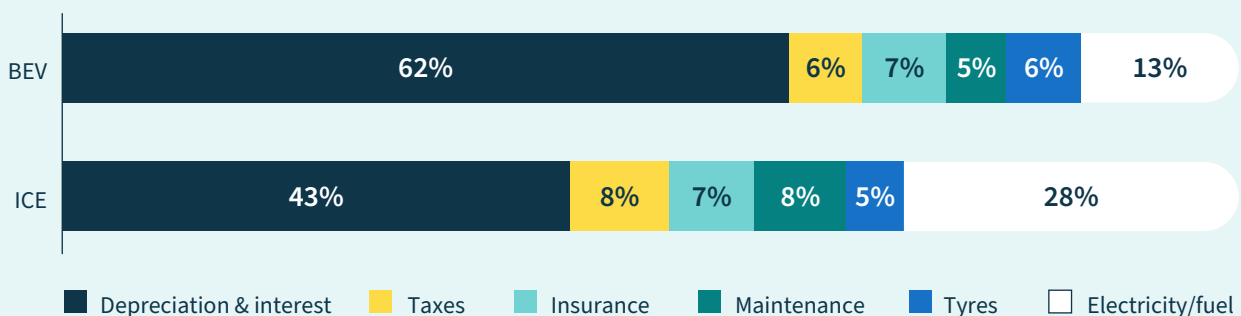


## TCO factors: examining BEV and ICE affordability in detail

When it comes to battery electric vehicles (BEVs), depreciation and interest costs tend to be much higher than for ICE vehicles. This is mainly due to the higher average purchase price for electric vehicles compared to their fossil fuel counterparts. Conversely, for internal combustion engine (ICE) vehicles, expenses related to fuel are much higher than that of battery electric vehicles, representing one-third of an ICE's total cost of ownership. This is nearly twice the corresponding costs of an electric vehicle.

The crux of the cost issue revolves around the high purchase price of BEVs and the ongoing efforts of original equipment manufacturers (OEMs) to make BEVs more economically accessible. As manufacturers work to introduce more budget-friendly BEV models, the prospect of an affordable transition to electric vehicles becomes increasingly viable for a significant portion of people. An essential aspect contributing to this powertrain shift is the strategic facilitation of cost-effective charging solutions, predominantly at home or the workplace. By promoting a favourable and convenient environment for affordable charging, the path towards embracing BEVs is well on its way to becoming a practical reality for a growing number of people.

### TCO breakdown





## Conclusions

This analysis underscores the economic viability of battery electric vehicles (BEVs) by comparing the total cost of ownership between ICE vehicles and BEVs. On average, the overall cost of operating a BEV consistently outperforms that of a comparable ICE. In fact, across the countries examined in this study, several scenarios strongly indicate that BEVs present a more cost-effective option.

The cost advantages of BEVs become more pronounced with an extended lease duration and increased mileage. This is attributed to diminished operational costs, particularly in terms of reduced road taxes and fuel expenses, coupled with the ability to amortize the higher initial investment value over a prolonged period.

Diving deeper into the comparison, notable differences in specific cost elements emerge when contrasting internal combustion engine (ICE) vehicles with BEVs. A significant factor is the cost associated with fuel and electricity, consistently tipping in favour of BEVs. This highlights the imperative nature of including these aspects in a comprehensive total cost of ownership (TCO) evaluation.



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