

Race to the top
EV vs ICE

Despite the global surge in enthusiasm for EVs, most vehicles on the road are still powered by an internal combustion engine (ICE). The industry is entering a phase of meaningful transition. This is reflected in the decisions facing drivers; many motorists who own an ICE vehicle intend to buy an EV as their next car. Here, things get complicated. It takes an enormous amount of energy to make a new car and, according to one school of thought, it's more environmentally friendly to keep an old ICE vehicle on the road for as long as possible than to trade it in for

mile past this, the lifetime emissions of the Tesla are lower. Exactly how much less a new EV will emit over a given period compared to an old ICE car depends on the power supply. Simply put, the cleaner the energy grid in an area, the lower the carbon cost of charging an EV.

Disposal

At the end of its life, an EV's battery again becomes a liability. Only about 5 per cent of lithium-ion batteries are currently recycled in the US and the chemicals they contain can be highly polluting if they leak out of landfills. But more and more companies are cropping up that specialise in responsible disposal.

Conclusion

The big takeaway from looking into the new-EV versus old-ICE question is how contingent it is. Location is a big concern. You can avoid the ethical concerns around lithium batteries by buying a hydrogen-powered fuel-cell electric vehicle (FCEL). But that won't make sense unless you live in

Special report:
Where next for the car?



a new EV. Is that true? To assess this, you have to account for the entire life cycle of a vehicle. This can be broken into its manufacture, its operation on the road and its disposal. Shall we take a spin? — HRS

Manufacture

At the manufacturing stage, EVs can generate about 80 per cent more emissions than a comparably sized ICE vehicle. Most of the pollution is generated making lithium-ion batteries, their most common source of power. This requires the extraction of minerals including lithium, cobalt and nickel from the ground, before heating them to high temperatures. The process uses a huge amount of (usually non-renewable) energy. Many of these minerals are extracted by workers in poor countries under hazardous conditions.

Operation

Once an EV has left the forecourt, however, it rapidly begins closing the emissions gap with ICE cars. Research by *The Wall Street Journal* and the University of Toronto compared the emissions of two of the most popular cars on the US market, the Tesla Model 3 (EV) and the Toyota RAV4 (ICE). For every mile driven, powering the Tesla with electricity emits 34 per cent of the emissions associated with powering the RAV4 engine with gasoline. By 20,600 miles (33,152km), the greenhouse gas emissions from building and driving the two cars level out. For every

Japan, the only country with a workable number of hydrogen filling stations for its size. On the other end of the spectrum, West Virginia's grid is so dirty that a hybrid vehicle has an emissions advantage over a pure EV because of the amount of coal that must be burned to charge a battery.

Our technical capabilities – such as our capacity to harness lithium sustainably – will continue to improve, even as protectionist manufacturing policies might complicate the EV supply chain. As much as we would like clear-cut answers to questions of sustainability in motoring, the wisest stance over the next few decades will be a combination of stoicism, flexibility and attentiveness to the conditions of specific markets.

At face value

For an increasing number of motorists around the world, the environmental footprint of a vehicle is a key consideration when purchasing a new car. The first hurdle for many, however, is the cost of an EV in comparison to those of combustion-engine vehicles.

Average prices, according to Kelley Blue Book (2022)

- \$56,656 (€52,324): Average price of a new ICE vehicle.
- \$64,454 (€59,520): Average price of a new EV.
- \$30,913 (€28,547): Average price of a used ICE vehicle.
- \$52,413 (€48,401): Average price of a used EV.