



The Continuing Evolution of Electric Vehicles

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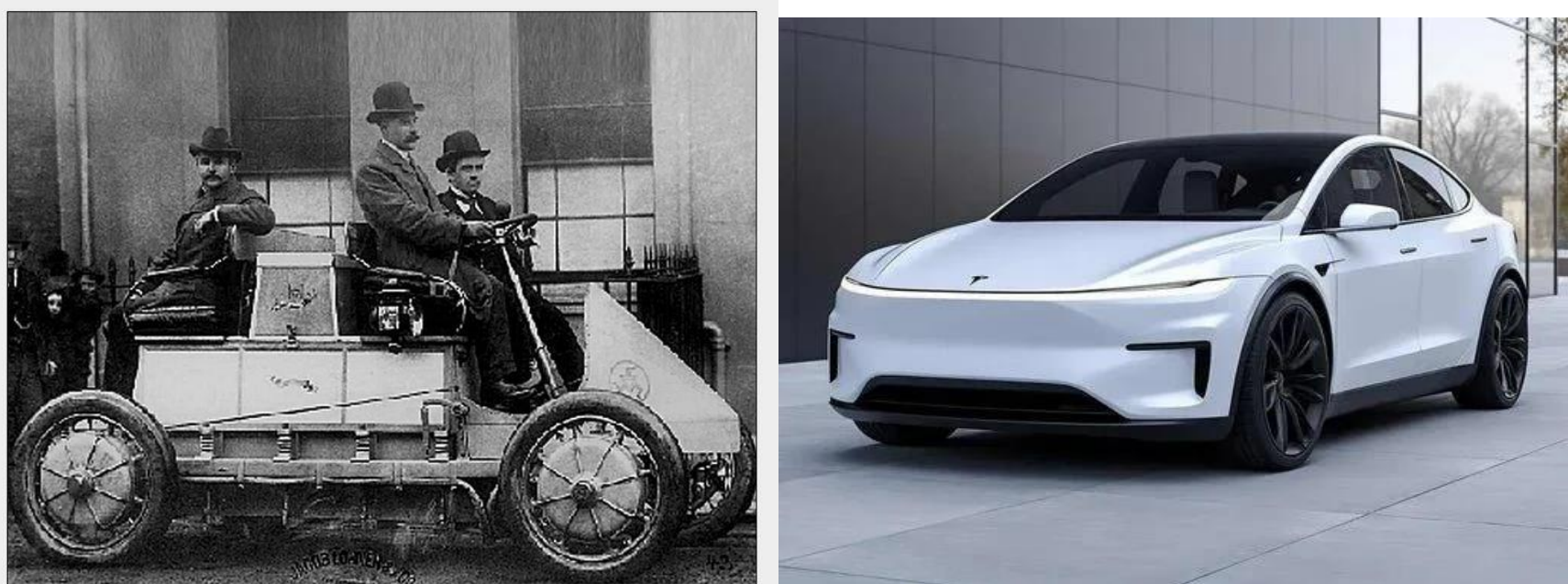
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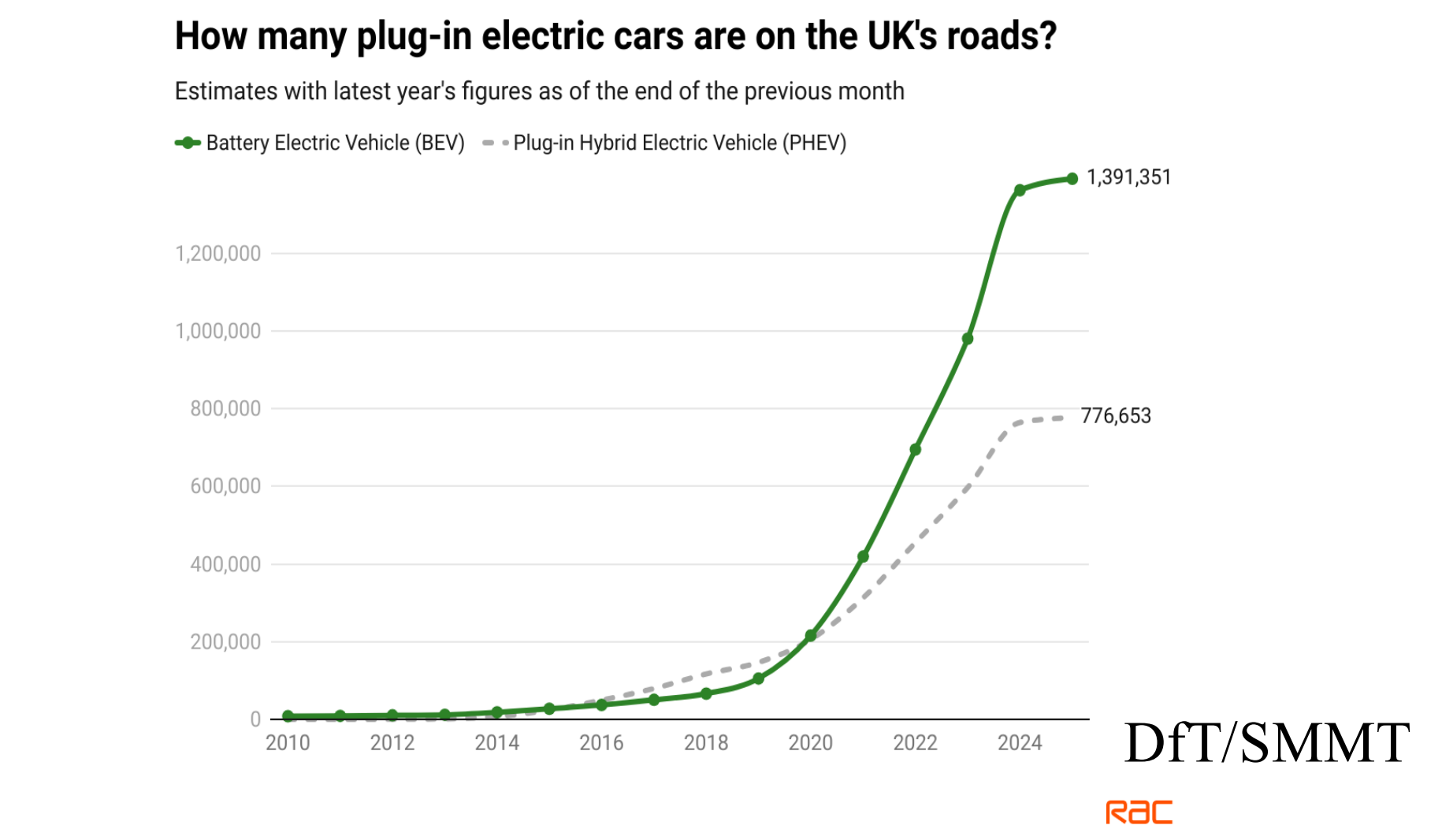
BEng Motorsport Engineering

Introduction

Many people think that the application of electric cars is a recent idea but, in reality, they have been around since the late 1800s alongside the internal combustion engine and steam powered vehicles, in the photos below on the left is the Egger-Lohner C.2 phantom designed by Ferdinand Porsche in 1898 and for comparison on the right is a Tesla from 2025



Where we were and where we are now
Historically as different technologies for self-propelled vehicles were being explored, the Internal Combustion Engine (ICE) became the best option and took off because it was lighter, more reliable, convenient and produced the most power. Emissions were not a concern as we entered the 1900s forcing electric motors into a corner where they were underutilised as mobility scooters, milk floats or used for experimental one-off prototypes until the early 2000s where people re-thought electricity as a viable source of motive power.

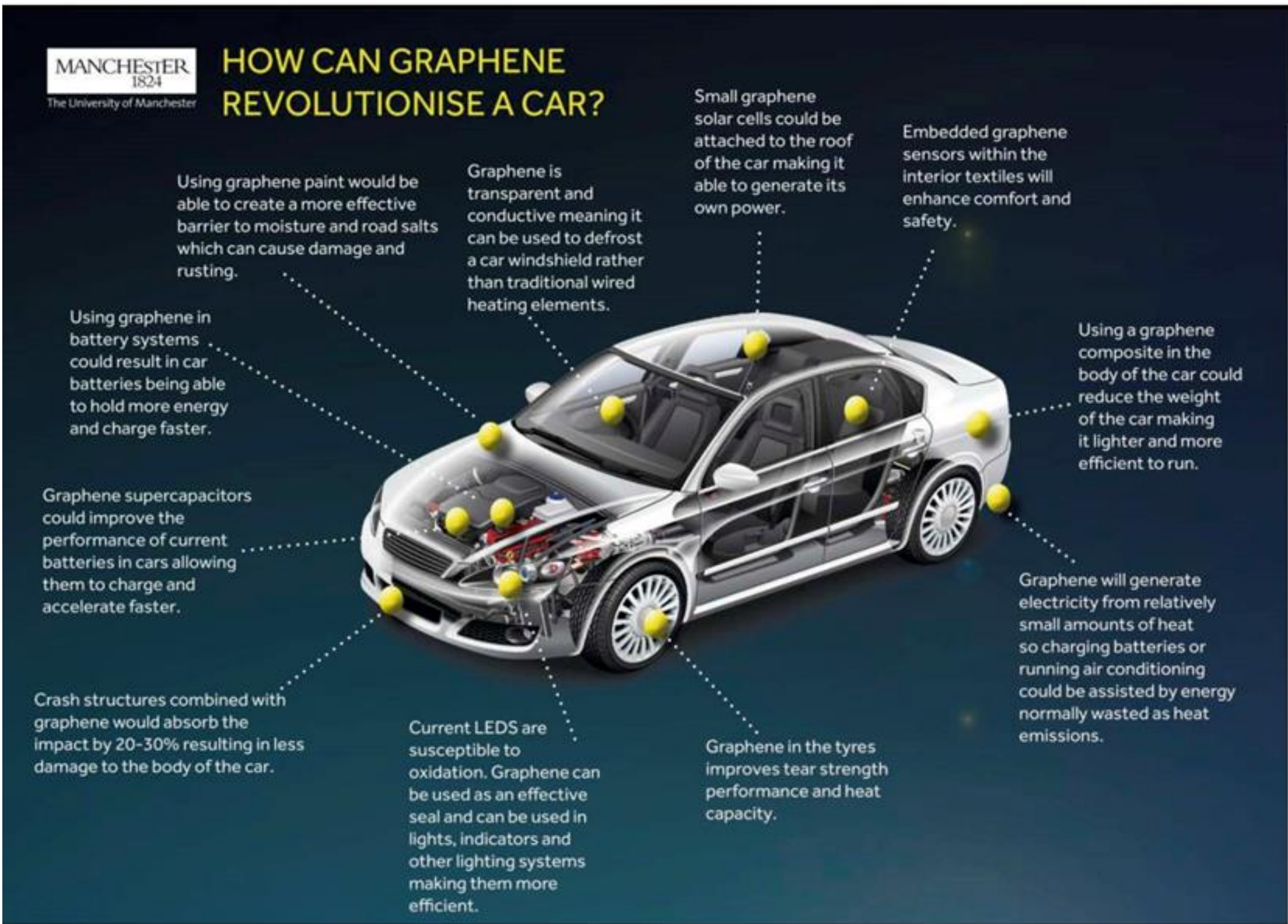


Advantages	Disadvantages
▪ Zero Vehicle emissions ▪ Minimal noise pollution ▪ Immediate Torque delivery ▪ Well suited for short urban journeys	• Emissions from fossil fuel electricity generation • Long charging time in comparison to filling ICE fuel tanks • Lithium-ion batteries are designed for low current applications • Lack of charging infrastructure

Batteries and why graphene is the future

- Lead Acid batteries are too heavy and are impractical to use in electric cars despite being useful for high current applications such as turning a starter motor.
- Lithium-ion batteries were designed for low current devices like phones, laptops and cameras. As emissions grew people turned to lithium-ion technology for electric cars as it what was already in largescale production, despite problems of short range, harmful mining and limited lifespan.
- Graphene offers significant advantages over lithium-ion such as being lighter, higher energy density, better heat dissipation and able to be charged faster which helps dismiss the problems of existing electric cars. However, at this time graphene batteries are difficult and expensive to produce, which pushes the expected date for largescale utilisation into the future.

"Graphene/lithium-ion batteries 1-2 years away
Solid state batteries 4-8 years away
Graphene supercapacitors 5-10 years away"
Dr. Kaku M. (2018) *The Future of Humanity*. Allen Lane



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Where we should go

Electric vehicle technology is essential for the future of the automotive industry which currently relies heavily on diminishing fossil fuels. The emissions from all ICEs today are a big factor in the greenhouse effect which is amplifying global warming.

By utilising graphene-based batteries which are lighter, higher capacity and structurally integrated, charging them with renewable energy sources, we can be environmentally friendly whilst making the automotive industry more advanced.

Furthermore, with the push of switching to electric cars in the UK by 2035, the assumption can be made that there will be a full implementation of this evolving mode of transport that we have had access to now for over a century.