

The Environmental Benefits and Advancement of Electrification Within The Automotive Sector

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Introduction To Electrification

Within the modern age there has been a move towards new methods of power. Due to global constraints, environmental factors and a public outcry, many sectors are working to develop new technologies which could reduce or completely replace the use of fossil fuels. This has led to a global push to advance the capabilities of electrification. According to Enelx (2022) electrification is a way to decarbonise final energy consumption in transportation, buildings and industry.

Traditional fossil fuels include coal, oil and natural gasses, which are extruded using fracking and mining methods. These methods have a detrimental affect on the planet, as it affects the climate and has a risk of causing air, water and sound pollution. While nuclear power is considered a safer method of power, when issues arise the environmental effects can become colossal.

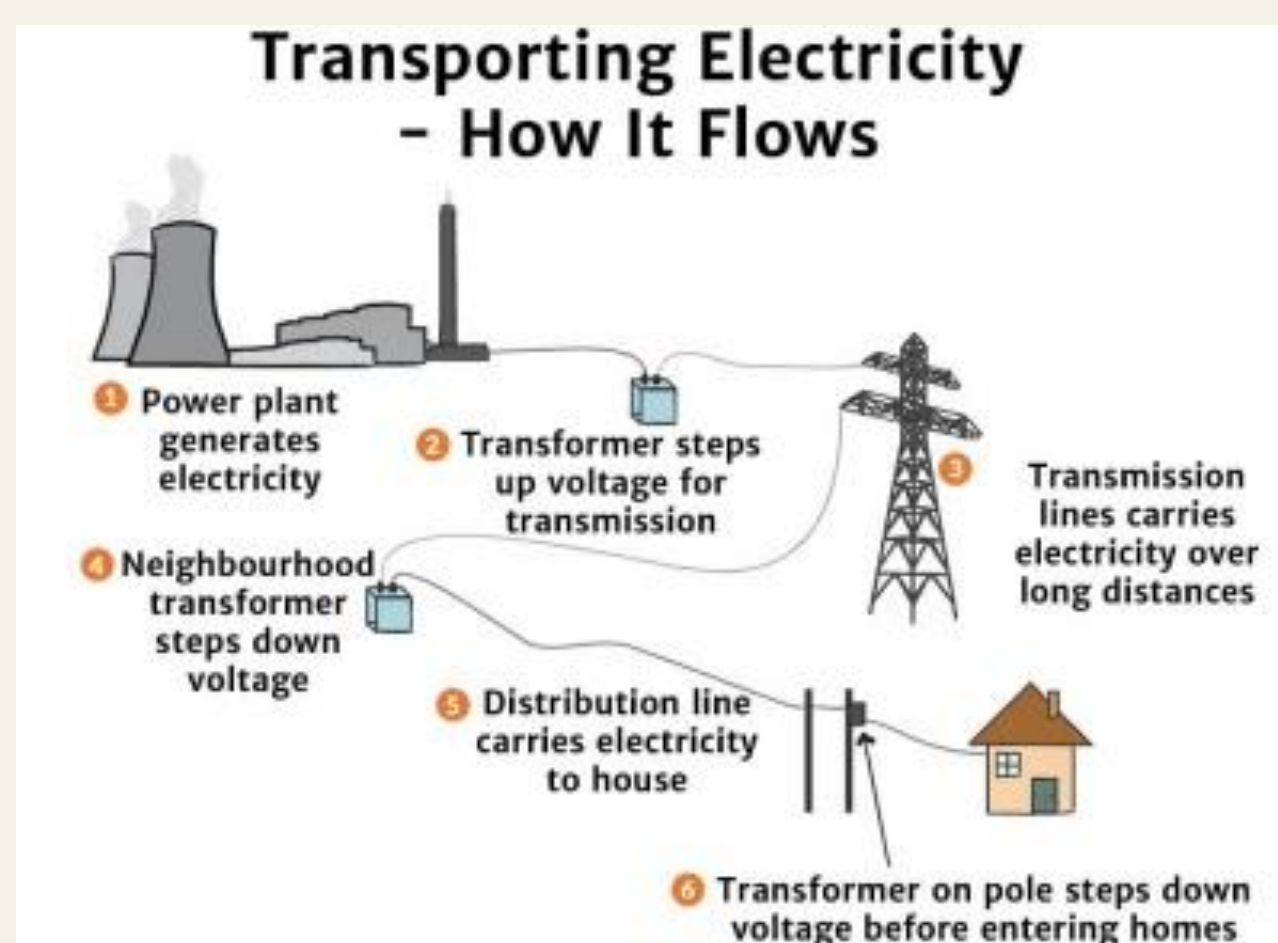


Figure 1: Transporting Electricity - How It Flows [Source: Solar Schools]

Advantages of Electrification

The main advantage of electrification is to help reduce emissions and therefore fight climate change. The main push for electrification within modern years to achieve carbon neutrality, something many countries and companies are aiming to achieve by 2050 (Source: Enelx (2022)).

But how does electrification help to achieve this goal? The main reason being that the use of electric energy will cut the amount of GHG emissions or greenhouse gas emissions that is created globally. This reduce in GHG will lead to an improved quality of a life for many, due to an improved quality of air especially within urban areas such as major cities i.e., London or major towns.

Electrification can help ensure an affordable and secure energy supply for many, including those in areas of poverty such as the developing world. This is due to electric energy having a higher energy efficiency than fossil fuels. Energy efficiency is described as being able to perform the same task while using less energy, in the simplest of terms you can perform the same task using electric energy as fossil fuels but use less energy to the same performance.

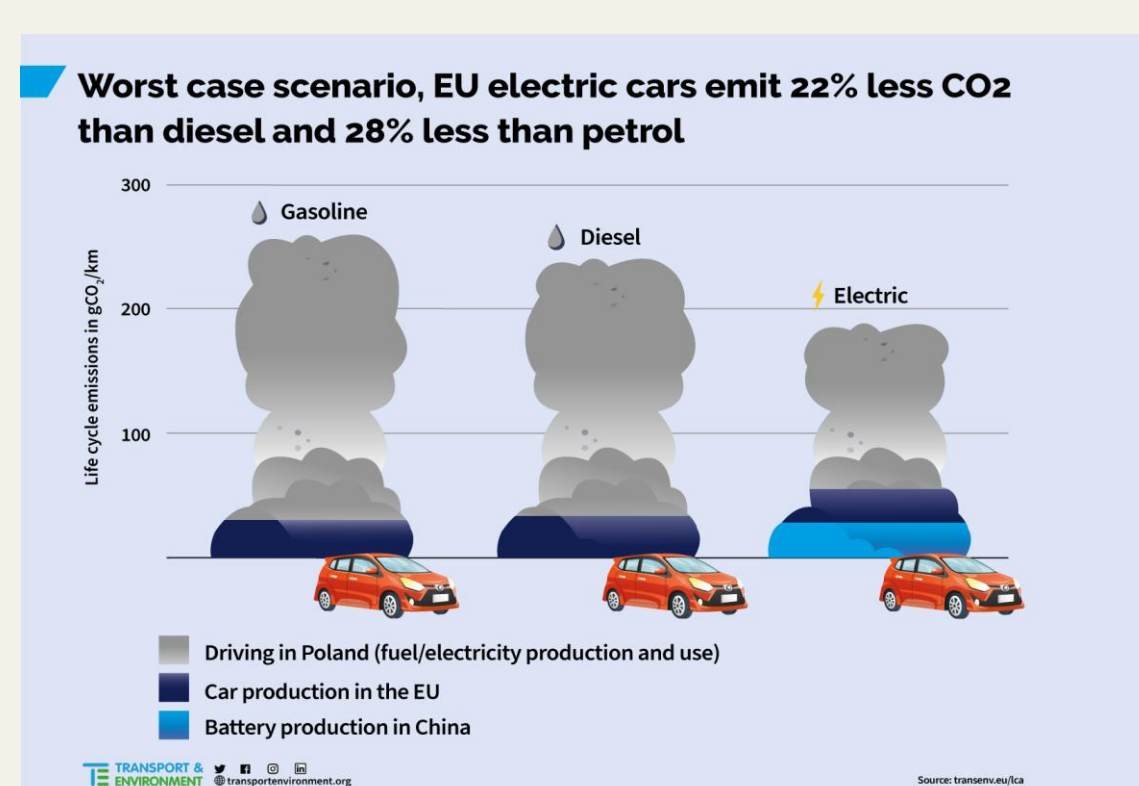


Figure 1: Electric Powered Vehicles Vs Petrol Vs Diesel [Source: Department of Transport & Environment]

Disadvantages of Electrification

The main disadvantages of electrification is the cost of start-up. When buying an electric vehicle, the price is often far higher than a petrol version of the same car. When a company or government invests in an electric train, helicopter of taxi this is also often far higher due to paying for developments and the relevant equipment needed for recharging is expensive.

The second main disadvantage of using electric vehicles in that they are not free of emissions. Electric vehicles cause a small amount of pollution due to the resources needed for charging are often not generated from renewable energy sources. Also, while when battery replacement is needed a large of amount of the material and cells can be replaced the recycling of lithium also have an environmental affect.

When using electric energy though there is a risk of electrical hazards, this is something that is often mentioned when discussing the electrification of the railway industry. There can also be electrical interference with the communication systems, something that is a concern for helicopters and the railway sector.

How Advancements Could Reduce Disadvantages

The main disadvantage which affects most households is the cost when discussing the choice to purchase an electric vehicles. This cost will be greatly reduced though in the next few years as electrification becomes more normal. More charging ports and advancements for faster charging would mean that this cost is greatly reduced.

There will also be a decrease in the emissions experienced by electrification as further advancements take place. One company working within the electrification sector is Williams Advanced Engineering.

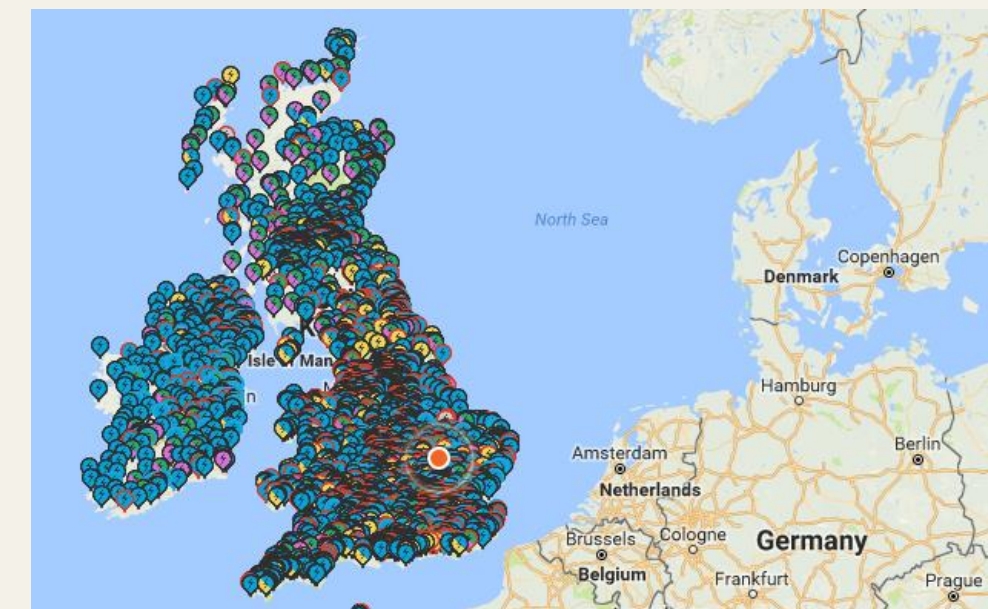


Figure 3: Charging Ports Within The UK [Source: CAR Magazine]

Motorsport Electrification

One sector which Williams Advanced Engineering have made huge advancements is within motorsport. Williams Advanced Engineering is the provider for all the batteries used within the FIA Formula E Championship, Electric World Touring Cars Championship and Extreme E Championship.

Electric racing has been on the rise in recent years, with more championships starting and a constant increase in viewers around the world. The Formula E Championship has recently become FIA approved and every season there is an increase in the number of countries the championship races in and the amount of people attending the races.



Figure 4: Formula E Battery [Source: Williams Advanced Engineering]

Electric motorsport is proving to the world that electrification can be beneficial to the environment as well as exciting and interesting to the public who watches the sport. Due to the increase in electric motorsport, there has also been an increase in interest from the general public in electric vehicles and transport methods.

Automotive Electrification

As shown within figure 5 currently transportation is the largest cause of greenhouse gas emissions, which currently stands at 29%. Due to the amount of greenhouse gasses emitted by transportation such as everyday road vehicles, electrification is a necessary step. According to Enelx (2022) it is estimated that in 2030 EVs (Electric Vehicles) will represent 67% of new private vehicles sales, and in 2050 EVs will represent almost 80% of private vehicles, rapidly growing from 64 million EVs in 2030 to more than 165 million EVs in 2050.

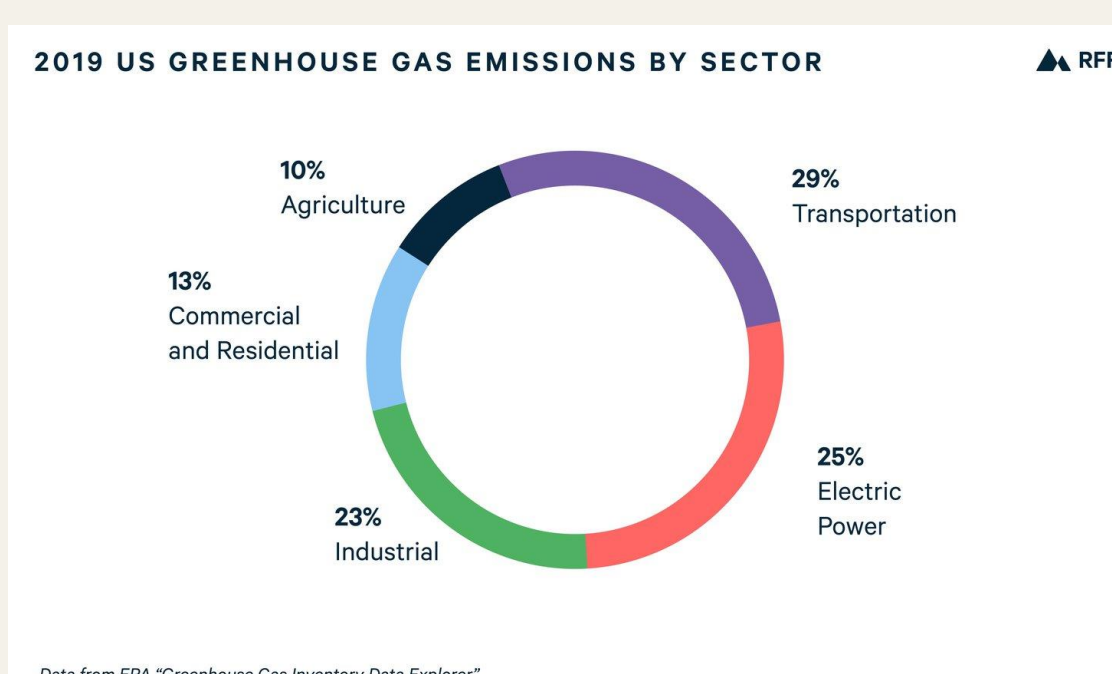


Figure 5: 2019 US Greenhouse Gas Emissions by Sector [Source: EPA]

The electrification of the automotive industry does not just apply to everyday road cars, Williams Advanced Engineering developed the Jaguar C-X75 which was used within the James Bond film SPECTRE. The car boasts a CO2 emissions of less than 99g/km, a maximum speed in of 200mph – not to mention the ability to sprint from standstill to 60mph in under three seconds – and a pure electric driving range of 50km. These figures prove that electric vehicles can not only stand alongside the figures presented by petrol vehicles but can also thrive and make improves on the industry standard figures.

These advancements are being developed as quickly as possible due to the normalisation of electric vehicles. The other big factor affecting the advancements of electric vehicles is the deadline of 2030, when the UK government is banning the sale of new petrol and diesel cars. Over the next few years further clear-air zones are being established in UK cities, meaning the want and now need for electric vehicles is growing.

Companies who work within the electric vehicle sector are constantly working on new developments such as faster charging times. Taking motorsport technology companies are constantly working on a battery which could be recharged in a matter of minutes. This technology will be developed and added into road vehicles.

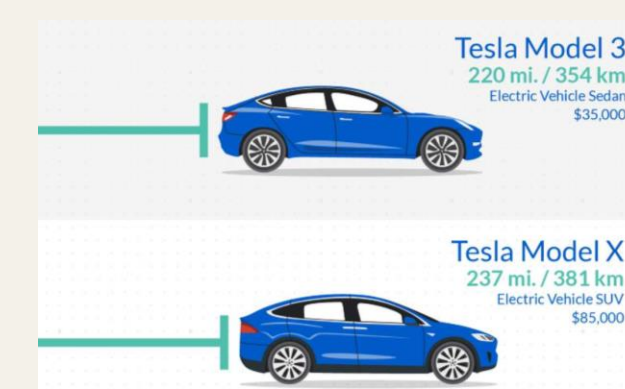


Figure 6: Electric Charging Ranges [Source: InsideEVs]

Transport Electrification

The other two methods of transport which are moving towards electrification is passenger helicopters and public transport such as taxis. Within the US the transportation sector makes up 29% of all greenhouse gas emissions; 10% of this is from air travel vehicles. The helicopter company Leonardo are currently in a research stage to reduce the environmental impact of aircraft through electrification. Industry professionals expect to see fully developed electrical helicopters flying passengers in the next five years.

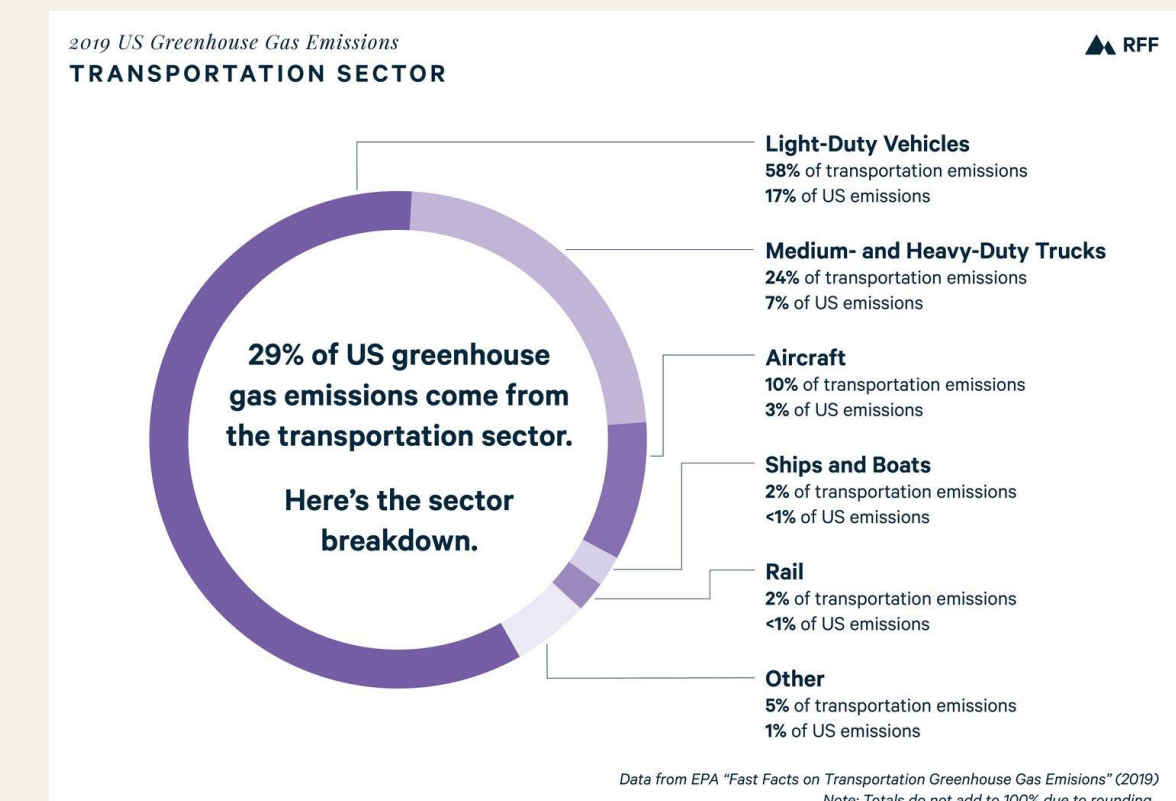


Figure 7: Transportation Greenhouse Gas Emission Breakdown [Source: EPA]

Another method of public transport that is currently going through electrification advancements is an electric bicycle. Williams Advanced Engineering worked alongside the manufacturer Brompton to create the Brompton Electric Bicycle in 2017, this bike features a 300Wh battery, a lightweight powerful front hub motor and intelligent sensors. Electric bicycles could be a great transportation method in the future when attempting to reduce vehicles. Especially within major cities these bicycles could be fantastic at reducing emissions while still providing a fast alternative for commuters.

Electric taxis are also becoming a fast reality with professional companies appear in major cities such as London, and electric taxis are being invested in by major companies and government transportation departments.

Conclusion

In conclusion, electrification has many advantages and disadvantages which have been outlined within this poster. Though many of the disadvantages will become obsolete with technological advancements and the normalisation of electric vehicles. While using electric energy does have small environmental effects the overwhelming benefits compared to fossil fuels outweighs the minor effects.

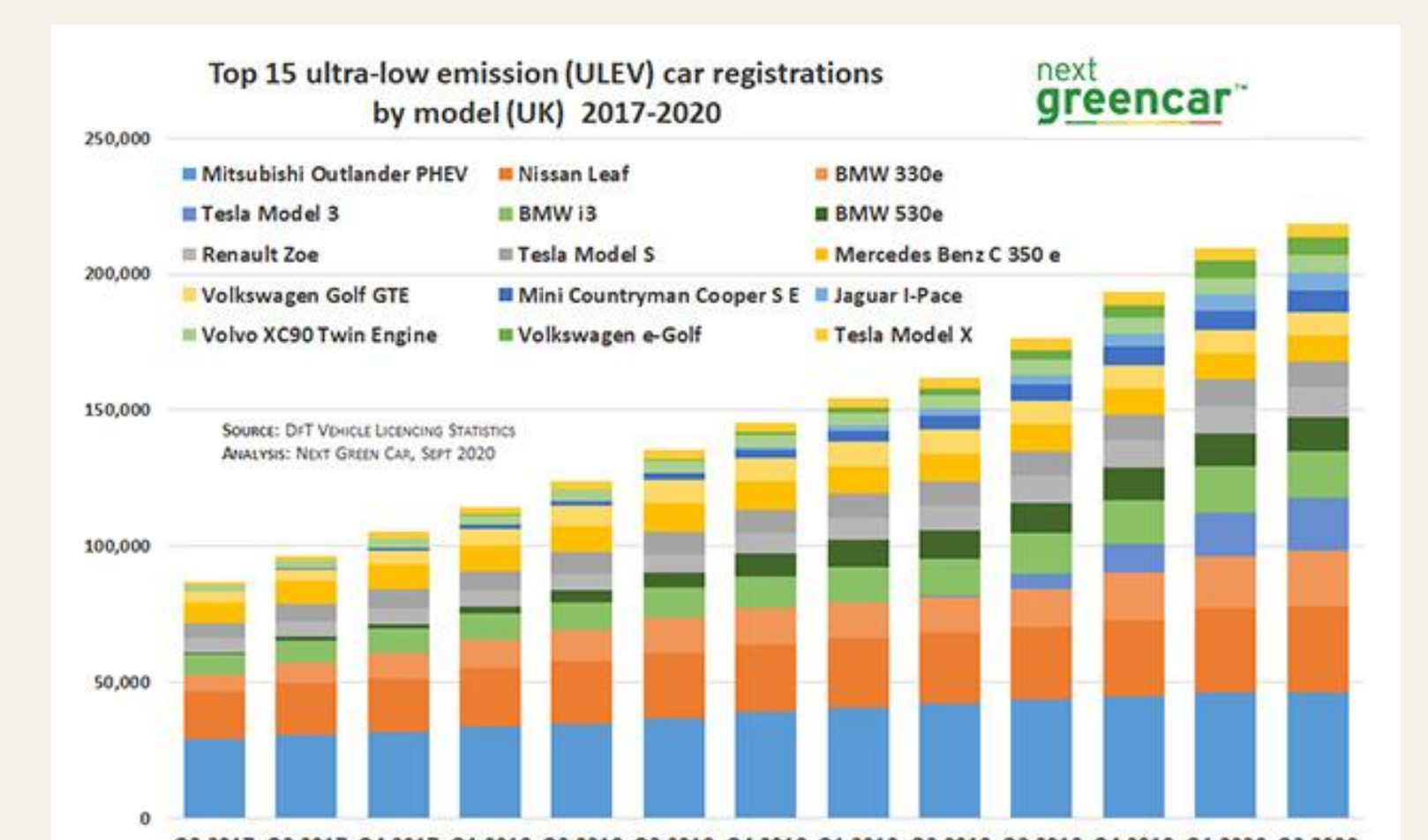


Figure 8: Increase in Electric Vehicles [Source: Next Green Car]

References

- Enel X (2022) *Electrification: Definition and Meaning*. Available at: <https://corporate.enelx.com/en/question-and-answers/what-is-electrification> [Last Accessed: 12/04/2022]
- Williams Advanced Engineering (2022) *Advanced Engineering Projects*. Available at: <https://wae.com/project/jaguar-c-x75/> [Last Accessed: 12/04/2022]
- Leonardo (2022) *Electric Propulsion*. Available at: <https://www.leonardo.com/en/innovation-technology/technological-areas/propulsions> [Last Accessed: 12/04/2022]
- World Nuclear Association (2022) *Where Does Our Electricity Come From?*. Available at: <https://world-nuclear.org/nuclear-essentials/where-does-our-electricity-come-from.aspx#:~:text=Despite%20the%20strong%20growth%20of,compared%20with%2061.9%25%20in%201990.> [Last Accessed: 12/04/2022]
- Sciencing (2022) *Electric Energy Advantages and Disadvantages*. Available at: <https://sciencing.com/electric-energy-advantages-disadvantages-6008663.html> [Last Accessed: 12/04/2022]