International Journal of Inventive Engineering and Sciences (IJIES)
ISSN: 2319-9598 (Online), Volume-13 Issue-11, November 2026

Electrical Vehicles and Their Future Impact on the Global Environment and Economy

Cullan Chalmers, Arshad Ahmed Mir*

Abstract: ***This research work has been undertaken with the aim of answering the following two research questions: i) 'Can switching to electric vehicles be more beneficial than that of their diesel/petrol counterparts?' and ii) 'Can changing to electric vehicles create less of a demand for oil and, in return, allow the U.K. to move to renewable energy sources? We chose these research questions because we believe the future of transport will depend heavily on electric vehicles. To answer these questions, we will use government studies on environmental impact, as well as research on the development of electric vehicles in recent years. In 2022, 14% of all new vehicles sold globally were electric, up from around 9% in 2021 and less than 5% in 2020. This trend is expected to continue, with projections indicating that electric cars could account for 18% of total car sales in 2023.***

Keywords: ***Electric Vehicles, Government Studies, Environmental Impact.***

Nomenclature:
EV: Electric Vehicle

I. INTRODUCTION

Over the past 20 years, belief that electric vehicles are the future of the automobile industry has grown. There are many reasons for this sudden move away from tried-and-tested petrol/diesel engines; the main reason is, of course, global warming. Although global warming is a major factor in the shift to electric vehicles, another reason is the continued depletion of oil resources. As available fuel has decreased, prices have risen drastically over the years, leading people to seek more sustainable and cost-effective options. In this research, we will explore these reasons in more depth.

In addition to the issues listed above, we will research the pros and cons of electric vehicles, the advancements already made, and what advancements are currently being developed. We will also examine whether the government and car manufacturers are doing enough to promote these environmentally clean options, or whether fear of lost profit is hindering these decisions. Cullan has worked in the Over the past 8 years, he has seen many changes in the electrical industry as technology has advanced to create more efficient and less environmentally damaging products. In this report, we will review published material about electric cars, recommend areas for improvement, and discuss current advancements the automotive industry has benefited from.

Manuscript received on 03 September 2026 | First Revised Manuscript received on 18 October 2026 | Second Revised Manuscript received on 05 November 2026 | Manuscript Accepted on 15 November 2026 | Manuscript published on 30 November 2026.

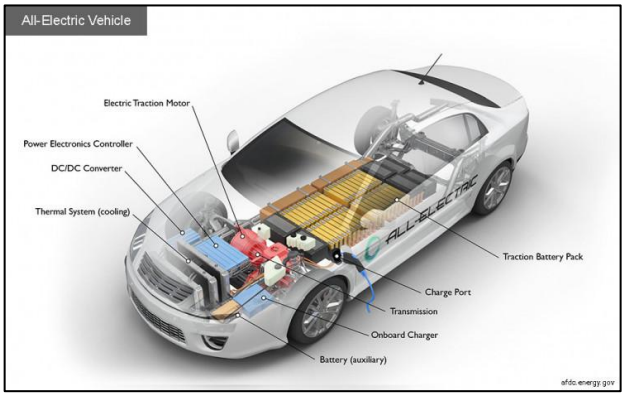
*Correspondence Author(s)
Cullan Chalmers, Department of EIT, University Centre Leeds, Mabgate Campus, 68 Mabgate, Sheepscar, Leeds, West Yorkshire, United Kingdom. Email ID: Arshad.Mir@leedscitycollege.ac.uk
Dr. Arshad Ahmed Mir*, Department of EIT, University Centre Leeds, Mabgate Campus, 68 Mabgate, Sheepscar, Leeds, West Yorkshire, United Kingdom. Email ID: cullan1@hotmail.co.uk, ORCID ID: 0000-0003-2232-747X

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open-access article under the CC-BY-NC-ND license http://creativecommons.org/licenses/by-nc-nd/4.0/

II. ELECTRIC VEHICLES (EVS): HOW DO THEY WORK?

An electric vehicle may look like any other vehicle on the road today; however, the similarities stop at aesthetics. A traditional petrol/diesel car uses fuel to power a combustion engine, which means it needs fuel lines, a carburettor, and a fuel tank. Electric vehicles do not require any of the listed parts; the parts of an electric vehicle are as listed below:

- **Battery (All-Electric Auxiliary):** This battery is used for start-up of the electric traction motor and to power the vehicle's accessories like the clock and radio.
- **Charge Port:** This is used to charge the batteries in the vehicle; this allows them to connect to a specially designed external power supply found in supermarkets, fuel stations, hotels, and personal homes.
- **DC/DC Converter:** This is used to convert the high DC voltage to a lower DC voltage. Because the traction battery runs at a higher voltage, this must be reduced for safe use in the vehicle and to operate the vehicle's accessories.
- **Electric Traction Motor:** This is used to convert electricity into rotational force that moves the wheels; certain vehicles have energy recuperation technology located inside the wheels (Volkswagen, 2021) [1].
- **On-Board Charger:** This is used to convert the AC power found in houses to DC for use in the vehicle; this is also used to monitor battery characteristics such as voltage, current, and temperature.
- **Power Electronics Controller:** Manages the power diverted from the battery to the motor to manage speed and torque generated.
- **Thermal Cooling System:** Used to maintain the operating temperature range of the engine, electric motor, power electronics and other components.
- **Traction Battery Pack:** This battery is used to power all the functional components of the car, such as the motor and other power components; this is essentially the fuel tank of the vehicle.
- **Electrical Transmission:** This device is used to deliver mechanical power from the traction motor to the vehicle's wheels (McFadden, 2020) [2].



[Fig.1: EV Car]

(McFadden, 2020)

III. LITERATURE REVIEW

The electric vehicle (EV) is difficult to date; however, many historical milestones mark the development of specific parts of the car. In the early 1800s, inventors began testing the idea of a fully electric-powered vehicle; around the mid-1880s, the first prototype cars began to emerge. In 1890, William Morrison, a chemist from Des Moines, Iowa, USA, successfully built a six-passenger vehicle that reached about 14 mph. This sparked more interest in electric vehicles and led to about 60 electric taxis in New York City over the next few years (Car and Driver, 2025) [3]. In 1898, Ferdinand Porsche registered one of the first vehicles in Austria: an electric vehicle known as the P1 (Porsche 1). This vehicle could produce 3 HP or 5 HP for short periods. This horsepower allowed the vehicle to reach up to 35 km/h and travel 80 kilometres, a range unknown for a vehicle at the time (Porsche, 2019) [4]. The P1 is on display at the Porsche Museum in Stuttgart, Germany.



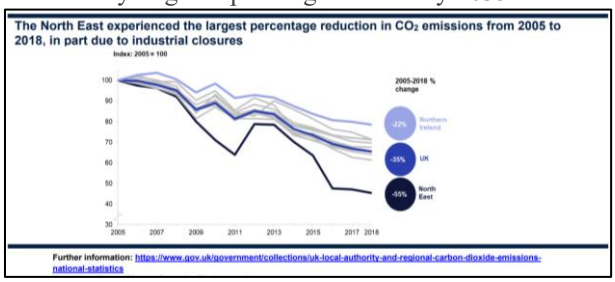
[Fig.2: P1]

(Porsche, 2019)

The industry has seen a massive influx of resources recently because global warming has become a global effort to reduce CO_2 levels worldwide. The G20 summit is a forum made up of the world's major economies and accounts for 80% of the world's GDP, 75% of global trade, and 60% of the planet's population. The G20 discusses many issues and sets many targets, including reducing CO_2 emissions; this target was part of the 2015 Paris Agreement set by the United Nations. Today, 189 countries have joined the Paris Agreement; the agreement states that the global temperature shall be limited to an increase of 2 degrees Celsius this century. Each nation's measures to reduce greenhouse gas emissions will be reviewed every 5 years, and countries in the agreement will help finance developing nations' efforts. (Nations, 2021) [5].

From 2005 to 2018, the northeast of England showed the largest reduction in CO_2 emissions, partly due to the closure of many industrial/manufacturing sites. (Department of Business, 2019) [6].

The UK Prime Minister recently announced an ambitious green strategy under which the UK could achieve net-zero carbon emissions by 2050. He revealed a £1 trillion green blueprint for the UK a fortnight before hosting the Cop26 climate summit. According to his plan, the UK government will pay £620m in electric car grants and spend £500m on cleaner technologies. The government defended plans to move entirely to green power generation by 2035.



[Fig.3: CO_2 Reductions 2005-2018]

(Department of Business, 2019)

IV. LEGAL ISSUES

A. Shell

On May 27th, 2021, a Dutch court ruled that Royal Dutch Shell (Shell) was responsible for its own CO_2 emissions and those of its suppliers, and it was given a deadline of 2030 to reduce its carbon emissions by 45% compared to its 2019 levels. This is a significant landmark for environmental activists, as it is the first time a company has aligned with the Paris climate accords. Shell had already set a target to become a net-zero emissions company by 2050; it also said it is already investing "billions of dollars in low-carbon energy, including electric vehicle charging, hydrogen, renewables and biofuels". The accelerated timeframe will help achieve the collective goal of lowering CO_2 levels worldwide and improving electric vehicle charging efficiency. A Dutch court also found Shell responsible for damages caused by oil leaks in the Niger Delta, and it must pay the farmers compensation. (Harrabin, 2021) [7].

B. Tesla

On May 26th, 2021, a Norwegian court ruled that Tesla issued a system update to protect the batteries in Model S vehicles between 2013 and 2015, which reduced range and decreased charging speed. Tesla has the right to appeal; however, if it doesn't, it must pay £11,500 for each complaint. Tesla has also made an out-of-court settlement with 126 customers in Norway who claimed the company's product did not match its marketing materials.

C. Volkswagen

Volkswagen is currently under investigation for installing a device in diesel engines that detects when the

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)
© Copyright: All rights reserved.

engine is under test and acts as a defeat device to alter emissions results; this investigation is known as Diesel gate. This is worrying, as it would falsify data collected during that period; for this reason, we have used only data gathered by the government or collected through legal proceedings.

V. ELECTRIC VEHICLE ENCOURAGEMENT

As the UK tries to move away from fossil fuels, the government offers grants to encourage people to buy electric vehicles. The government reviewed its grant system this year and, on 18th March 2021, decided to reduce the grant from £3,000 to £2,500. It also reduced the eligible car price cap from £50,000 to £35,000 (Jolly, 2021) [8]. In our view, this recent reduction by Chancellor of the Exchequer Rishi Sunak will lead to fewer electric vehicle purchases, which will affect current CO_2 levels and make it harder to meet the Paris Agreement.

The government also has a domestic renewable heat incentive that can help finance heating options such as biomass boilers, solar water heating, and certain heat pumps.

Renewable energy is becoming more popular, with some companies, such as Octopus Energy, opting for 100% renewable energy. In 2020, renewable energy overtook fossil fuels as the UK's main energy source, at 43%; this is a big increase compared to the 2019 level of 37%. This is a major step in the right direction and shows that the UK can move towards 100% renewable energy given time and continued improvements in electric vehicles. We believe that answers our question: 'Can changing to electric vehicles create less of a demand for oil and in return, allow the U.K to move to renewable energy sources?'

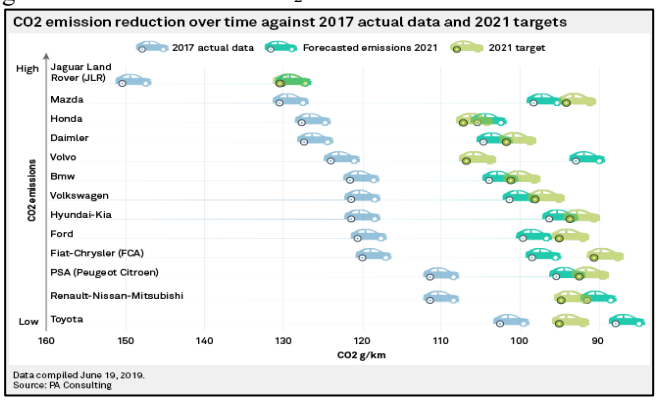
VI. CONCLUSION AND RECOMMENDATION

Our professional opinion is that electric vehicles have developed a lot since they were first created in the 1800s, and we believe there is plenty more improvement to come, as mentioned in the legal issues section, which mentions the software update issues from Tesla and that Shell is investing billions in electric vehicle charging, showing that improvements are going to be made off the back of these legal issues. Another reason we feel that the future will rely heavily on electric vehicles is that the government has announced that they want to ban the sale of new petrol/diesel vehicles by 2030 (Porter, 2020) [9]. This will mean only electric or hybrid vehicles will be sold; this will, in turn, reduce demand for fossil fuels, which will lower prices and help reduce CO_2 emissions in the UK. We believe hybrid vehicles will be the more popular option over the next 10-20 years, as they have a larger range than pure electric vehicles. If batteries can be developed to hold a longer charge, or if electric vehicles can use an alternator system to recharge the batteries while driving, then electric vehicles could become the more popular option.

Taking all this into consideration, we believe the answer to our research question, 'can switching to electric vehicles be more beneficial than that of their diesel/petrol counterparts?' is yes. The future benefits outweigh the negatives of lower range and recharge times. The benefits will be things such as:

- Lower emissions
- Ongoing software updates
- Lower road tax
- Lower fuel dependency
- Clean energy generation
- Fewer mechanical parts

The second research question is 'can changing to electric vehicles create less of a demand for oil and in return allow the U.K. to move to renewable energy sources?' We mentioned our views on this question in another section of the paper. To clarify, we believe switching to electric vehicles can help the UK move to renewable energy sources; this is supported by companies moving away from fossil fuels, such as Octopus Energy, which uses 100% green energy for its services. Some other companies are also moving in that direction. We also believe reducing fossil fuel-powered vehicles will support global efforts to reduce CO_2 levels.



[Fig.4: CO_2 Emission Reduction Graph]

(Murphy, 2019) [10]

This image (Fig. 4) shows a graph of CO_2 emission reductions from 2017 to 2019, when the data were gathered. The EU set a target to reduce CO_2 emissions from mainstream automakers operating within its borders to 95 grams per kilometre by 2021, or face fines of 95 euros per gram over the limit. As we can see from the graph, car manufacturers that are predicted to surpass their targets are:

- Honda
- Volvo
- Toyota
- Renault-Nissan-Mitsubishi
- Jaguar Land Rover is predicted to meet its target

The companies predicted to fail to meet targets and risk incurring fines of 95 euros are as follows.

- Mazda
- Daimler
- BMW
- Volkswagen
- Hyundai-Kia
- Ford
- Fiat-Chrysler
- Peugeot-Citroen

Because these predicted emissions are based on 2019 data, most companies still have a chance of hitting their 2021 targets. For this reason, we will wait until the end of 2021, then gather more data to compare it with the graph in Fig. 3.

In conclusion, we believe that researching this project has given us better insight into how an electric vehicle works. It has also led us to evaluate our own way of life and

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)
© Copyright: All rights reserved.

consider switching our cars to hybrid or electric vehicles. We have also switched to a 100% renewable energy provider for our homes, as we have decided to do our part to help reduce CO_2 levels in the UK.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

- **Funding Support:** This article has not been funded by any organisations or agencies. This independence ensures the research is conducted objectively and without external influence.
- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate, with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Authors' Contributions:** The authorship of this article is contributed equally by all participating individuals.

REFERENCES

1. Volkswagen. (2021). Retrieved from https://www.volkswagen.co.uk/electric/sustainability/brake-energy-recuperation
2. McFadden, C. (2020, 07 01). A brief history and evolution of electric cars. Retrieved from https://interestingengineering.com/a-brief-history-and-evolution-of-electric-cars#:~:text=An%20abbreviated%20electric%20car%20history%20timeline%20%20,various%20oth%20...%20%2029%20more%20rows%20
3. Car and Driver (2025, 06 15). Worth the Watt: A Brief History of the Electric Car, 1830 to Present.Retrieved from https://www.caranddriver.com/features/g43480930/history-of-electric-cars/
4. Porsche. (2019, 09 13). The history of Porsche begins electrically. Retrieved from Porsche.com: https://newsroom.porsche.com/en/products/taycan/history-18563.html
5. Nations, U. (2021, 05 28). Climate Action. Retrieved from UN.org: https://www.un.org/en/climatechange/paris-agreement
6. Department of Business, E. &. (2019). Retrieved from Gov.uk: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/894723/2018_LA_CO2_emissions_stats_one_page_summary.pdf
7. Harrabin, R. (2021, 05 27). Retrieved from bbc.co.uk: https://www.bbc.co.uk/news/world-europe-57257982
8. Jolly, J. (2021, 03 18). Retrieved from The Guardian: https://www.theguardian.com/environment/2021/mar/18/uk-slashes-grants-for-electric-car-buyers-while-increasing-petrol-vehicle-support
9. Porter, A. (2020, 11 18). 2030 ban of new petrol and diesel cars: what will it mean for you? Retrieved from Which.co.uk: https://www.which.co.uk/news/2020/11/2030-ban-of-new-petrol-and-diesel-cars-what-will-it-mean-for-you/#:~:text=The%20UK%20government%20is%20bringing%20forward%20the%20ban,February%202020%29%20and%20now%20from%202035%20to%202030.
10. Murphy, P. (2019, 06 26). Automakers seen missing EU emissions target as 2021 deadline nears. Retrieved from spglobal.com: https://www.spglobal.com/marketintelligence/en/news-insights/trending/a8D-g5ppPqjk_B7VxDRaMA2?utm_source=twitter&utm_medium=social&utm_term=42f979cf-dfdf-4d03-b1a1-5108005133f7&utm_content=organic&utm_campaign=chartwatch

AUTHOR'S PROFILE



Cullan Chalmers started his career as an apprentice electrical engineer and has since gained extensive experience across multiple sectors, including domestic, industrial, and renewable energy. He completed his Higher National Certificate (HNC) and Higher National Diploma (HND) in electrical engineering at Leeds City College. He gained recognition within the steel industry, winning the Student of the Year award from the Institute of Cast Metal Engineers (ICME) in 2018. Working within the steel industry, he has gained an understanding of the environmental impact the industry has had on the planet today, which, combined with his interest in engineering and the automotive industry, led to this research paper on electric vehicles and their future environmental impact while completing his Higher National Diploma at Leeds City College.



Dr. Arshad Ahmed Mir Biography: After my graduation in Mechanical Engineering, I worked in the heavy machinery manufacturing industry for 9 years. I won a Merit Scholarship for my MSc and PhD in Mechanical Engineering. I then worked as a Research Fellow at the University of Birmingham and the University of Leeds for 6 years. During that period, I also taught various Mechanical Engineering modules. Afterwards, I worked as a faculty member in different colleges/universities in the UK. Since 2020, I have been working as an HE Lecturer in Engineering at University Centre Leeds. My research interests include engineering materials, Nanotechnology, Sustainability, and Renewable Energy. I have 15 publications in various peer-reviewed journals and international conference proceedings. I have also participated in several international conferences and presented my research. I have also supervised several engineering student research projects.

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the Publisher /Journal and/or the editor(s). The Publisher /Journal and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.

© Copyright: All rights reserved.