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Charging Ahead: Unlocking Business Opportunities in the UK's Transition to Electric Vehicles

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TRANSFORMATIVE ENTERPRISE RESEARCH GROUP (TERG)

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Executive Summary

The purpose of this paper is to examine the current state of electric vehicles (EVs) in the UK, with a focus on the challenges and opportunities for businesses as they transition from internal combustion engine vehicles (ICEVs) in line with the government's Net Zero roadmap. The plan to phase out ICEVs by 2035, with a ban on new sales by 2030, is driven not only by regulatory mandates but also by increasing pressure from partners and customers for more sustainable practices, particularly through the adoption of EVs.

The UK government's strategy primarily aims to reduce greenhouse gas (GHG) emissions, with transport accounting for over 20% of the EU's total emissions, half of which are attributed to passenger vehicles. At the COP26 climate conference in 2021, the UK committed to phasing out ICEVs globally by 2040, and by 2035 in leading markets, highlighting the urgency of this transition.

This review emphasises the need for UK businesses to evaluate their environmental impact and explore practical steps to adopt battery electric vehicles (BEVs). Despite strong political support, concerns remain about the feasibility of meeting the Net Zero targets, particularly regarding the UK's electrical infrastructure and the logistical challenges of replacing millions of diesel and petrol vehicles.

The literature review assesses whether it is practical for a national organisation to transition to a fully electric vehicle fleet in the UK, considering the implications of the Net Zero targets, the current state of the UK's electrical infrastructure, and the strategic decisions businesses must make to seize the opportunities presented by this significant shift in the transport sector. The review identifies potential business opportunities, such as cost savings through fleet electrification, enhancing corporate sustainability credentials, and optimising energy usage with on-site charging solutions. Furthermore, it proposes areas for future research to explore how businesses can maximise profitability and efficiency in this evolving landscape.

Introduction

This literature review explores the current state of electric vehicles (EVs) in the UK, focusing on the challenges and opportunities for businesses as they move away from internal combustion engine vehicles (ICEVs) in line with the government's Net Zero roadmap. According to this plan, ICEVs will be phased out by 2035, with a ban on new sales by 2030. This shift is driven not only by government regulations but also by growing demands from partners and customers for more sustainable practices, especially the adoption of electric vehicles.The UK government's strategy is mainly aimed at reducing greenhouse gas (GHG) emissions, with transport contributing over 20% of the EU's total emissions, half of which come from passenger vehicles (Fetting, 2020). At the COP26 climate conference in 2021, the UK committed to phasing out ICEVs globally by 2040 and by 2035 in leading markets, as stated by the Department for Business, Energy & Industrial Strategy, Department for Energy Security and Net Zero, and Department for Transport (2022).

This review underscores the need for UK businesses to evaluate their environmental impact and consider the practical steps required to adopt battery electric vehicles (BEVs). Despite strong political support, there are concerns about the feasibility of meeting the Net Zero targets, particularly about the UK's electrical infrastructure and the challenge of replacing millions of diesel and petrol vehicles (Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy, 2019).

The aim of this literature review is to assess whether it is practical for a national organisation to transition to a fully electric vehicle fleet in the UK. It will examine the implications of the Net Zero targets, the current state of the UK's electrical infrastructure, and the strategic decisions businesses need to make to take advantage of the opportunities in this rapidly changing sector.

UK Government's Net Zero Strategy

In 2017, the UK Government released a plan for reducing roadside nitrogen dioxide. Within this publication, the government announced its plans to end the sale of all new ICEVs by 2040, as outlined by Department for Environment, Food & Rural Affairs and Department for Transport (2018). However, two years later (in 2019), the UK's Climate Change Committee contradicted the government's plan, in saying that 2040 was too late a target, for ICEVs to be phased out and that the 'sales ban on conventional vehicles should be moved to 2030-2035' (Climate Change Committee, 2019), to which the government responded by expediting the deadline for the ban of ICEV sales, moving it to 2035, as outlined by (Department for Business, Energy & Industrial Strategy and Department for Environment, Food & Rural Affairs, 2019).

In 2021, the UK Government announced its plans to reach net zero emissions by 2050. The motivation behind the net zero strategy comes from rising levels of GHGs, which result in increased global temperatures according to Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy (2021). Within the net zero strategy, the government identified key milestones, policies and actions that will support the transition; the three main urgent action points identified, were to 'end coal fired power generation, halting deforestation and the eradication of petrol and diesel engines from all cars' (Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy, 2021). The decision to retire of petrol and diesel engines is likely to have the most significant impact on UK businesses, since 45.1% of people within England and Wales travel to work by car or van, according to Office for National Statistics (2022). In addition, the number of commercial vehicles registered in the UK in 2021 was 396,010 (Carlier, 2022).

The government's roadmap states that the UK will end the sale of petrol and diesel cars by 2030, then all cars must be fully zero emission capable by 2035. However, this strategy does not take into consideration the life expectancy of petrol- and diesel-powered vehicles, which is approximately 13.9 years, as Logan et al. (2021) suggests. Kalghatgi (2020) also identifies the wasted potential that will come from the ban of ICEVs; in terms of research & development, talent, and opportunity to improve the existing technology. Furthermore, Kalghatgi (2020) goes on to point out the segregation of the UK from other countries, who's net zero plans are not as imminent, as they will have more time to develop existing vehicles and potentially make them net zero without the need to switch to EVs.

Whilst EVs provide environmental benefits over ICEVs, the social and economic implications on the consumer, must also be considered. Kuo et al. (2022) identified economic barriers that effect the adoption and transition to EVs; suggesting purchasing costs, maintenance expenses and initial costs of batteries, as well as a lack of understanding of fuel prices. In addition to understanding fuel prices, there will be concerns from UK consumers over the rising cost of electricity, which according to Francis-Devine et al. (2023) is a result of the Covid-19 global pandemic and the war between Russia and the Ukraine. According to Office for National Statistics (2023), electricity prices have risen by 66.7% between March 2022 and March 2023. On top of this, comes the 'range anxiety' from driving EVs, which is 'a fear of running out of electricity before reaching the next EV charge point' (Pevec et al., 2019) and is a new concept for UK drivers, which questions the EV charging infrastructure in the UK.

Current EV Charging Infrastructure in the UK

In March 2022, the UK government released the 'UK Electric Vehicle Infrastructure Strategy' (Department for Transport, 2022) in which the Secretary of State for Transport set a goal of 300,000 public charge (as a minimum) points by 2030. However, in January 2023, the government published statistics that stated there were only '37,055 public EV chargers in the UK' (Department for Transport, 2023), which was up by 2,418 chargers since October 2022. However, if this number of public charge points was to continue to increase at the same rate, there would only be an additional 67,704 chargers in the UK by 2030, falling short of the proposed target (300,000) by almost 200,000 charge points.

Despite the number of public chargers in the UK, it is important to consider the way in which EV drivers in the UK charge their vehicles. According to Hardman et al. (2018), home charging was the most popular location for charging an EV (approximately 50%-80% of all charging), followed by workplace charging and then public charging. In 2021, the government introduced incentives for installing charge point both at home and at their workplace, through the 'Electric Vehicle Homecharge Scheme' (EVHS) and 'Workplace Charging Scheme' (WCS) (Office for Zero Emission Vehicles, 2021).

It is common knowledge that the increase in EVs on the roads is going to increase the demand on the electricity grid, as outlined by McKinney, Ballantyne and Stone (2023) The increase in home charging has significantly influenced the demand on the electricity grid, particularly in rural areas/areas that 'consist of less robust infrastructure' (McKinney, Ballantyne and Stone, 2023). As a result, in December 2021, the government passed law on the 'Electric Vehicle (Smart Charge Points) Regulations act' (Department for Transport and Office for Zero Emission Vehicles, 2020), which came into effect in June 2022.

According to Department for Transport and Office for Zero Emission Vehicles (2020), the aim Electric Vehicle (Smart Charge Points) Regulations were brought into legislation to ensure EVs can be effectively integrated whilst supporting the UKs energy infrastructure. The method of EV smart charging shifts charging to different times of the day; for example, overnight where demand is lower on the grid or where renewable energy generation is at its highest – this reduces strain on the grid. The legislation states that all EV charge points (EVCPs) manufactured after 30th June 2022 'must be pre-configured with pre-set default charging hours which are out of peak hours' (The National Archives, 2021) and they must be 'capable of operating with a delay of up to 1800 seconds' (The National Archives, 2021), which would be randomised, based on the current demand on the grid. However, the regulation also states that the owner of the EVCP must have the ability to 'remove pre-set default charging hours' or be able to alter them during first use or at any given time.

On the back of the introduction of the EV Smart Charging Regulations, a number of electricity supply companies have introduced split rate (day & night) tariffs, known as Economy 7 tariffs, in which night-time (off-peak) energy is provided at a much cheaper rate. Therefore, when a consumer on an Economy 7 plugs a vehicle in to charge, the charging session will not begin until midnight, according to McKinney, Ballantyne and Stone (2023), at which point electricity is at a lower cost. Hatziargyriou, Karfopoulos and Tsatsakis (2013) suggests EV charging could have an aggressive impact on grid demand, by encouraging a new 'peak' time in the late afternoon, when EV drivers return home from work. However, the Economy 7 tariff mitigates strain on the grid and allows for a more stable grid demand pattern.

Comparing the UK to other European Countries

According to United Nations (2015), climate change goes beyond national boarders; instead, they argue climate change a global emergency. In 2015, at the COP21 Climate Change Conference in Paris, leaders from across the world entered into 'a legally binding international treaty on climate change' (United Nations Climate Change, 2015) known as the Paris Agreement. Unlike other agreements such as the 'Kyoto Protocol' (United Nations Climate Change, 2005), the Paris Agreement does not have set targets for individual countries, instead it provides an overall climate change goal and encourages parties to contribute to the overall goal, as stated by Streck, Von Unger and Keenlyside (2016). As a

result, nations that form part of the Paris Agreement set out their own targets in relation to reducing GHG emissions which, in turn contribute to the Paris Agreement targets.

Netherlands

According to Ministerie van Economische Zaken (2019), the Dutch government aims to reduce GHG emissions by 49% by 2030, with a further reduction of 95% by 2050, in comparison to the GHG emission levels of 1990. In June 2019, the Dutch government legislated the Climate Act, which includes policies such as the National Climate Agreement. The National Climate Agreement is an agreement between six sectors including electricity, industry, traffic, transport and others – 'the agreement is based on the principle that reducing carbon emissions must be feasible and affordable for everyone' (Ministerie van Economische Zaken, 2019).

Focussing on the transport sector, according to Ministerie van Economische Zaken en Klimaat (2019) their ambition is for all new cars sold to be emission-free by 2030 at the latest; their solutions include EVs and hydrogen-powered vehicles. Van Vuuren et al. (2017) argue that making zero-emission vehicle could be the future standard, however it would require companies to become more innovative in terms of carbon capturing. Furthermore, the group go on to suggest that carbon capture would not be successful unless the 'infrastructure for storing and transporting the CO2 has been organised' (van Vuuren et al., 2017).

In the Netherlands, the public EVCP roll-out plan started in 2009; where responsibility over infrastructure, application and installation procedure was delegated to local and regional governments up until 2013, according to Helmus et al. (2018). This is further supported by Hall and Lutsey (2017) who states that local and regional governments have been promoting EVCP infrastructure, and that in certain provinces public smart charging schemes emerged as early as 2014. The Dutch EVCP 'infrastructure was initiated by ElaadNL' (Hall and Lutsey, 2017), a 'partnership consisting of the seven united grid operator who manage Dutch electricity and gas' who 'continue to upgrade and maintain around 3,000 EVCPs around the country' (ElaadNL, 2023).According to Statista (2023), in 2023 there were almost 70,000 regulars public EVCPs (available 24/7 to the public) with an additional 50,000 semi-public EVCPs (owned by private operators that open their EVCPs for public use). This gives a combined total of around 120,000 public EVCPs, which is a significant increase from 2021, where the combined total was 82,000.

Denmark

According to KPMG (2022), in June 2020 Denmark legalised their CO2 emission reduction targets: to reduce CO2 emissions by 70% by 2030 (in comparison to their 1990 emission levels) with an aim of becoming Net Zero by 2050. Denmark has adopted a strategy to increase their renewable energy generation (such as Solar PV, offshore wind and hydro) which has resulted in Denmark having amongst the lowest intensity of emissions within the

Organisation for Economic Cooperation and Development (OECD) countries, as Barker et al. (2022) state.

The reduction of carbon emissions from vehicles is a priority within the Danish government's strategy. The Danish government have been promoting the use of biofuels (such as Hydrated Vegetable Oil (HVO)) as a short-term solution, according to Barker et al. (2022), however, the resources required can be very large for HVO. In December 2020, the Danish government passed The Green Transportation Agreement within parliament, which sets the target for zero and low emission cars on the road at 775,000 by 2030 (Barker et al., 2022).

Halvgaard et al. (2012) explains that the renewable energy generated in Denmark requires either large storage infrastructure, or it needs to be hugely flexible. Moreover, they suggest that a solution to this storage issue would be in the batteries within EVs. This theory reverses the common ideology that EVs are a disturbance to energy load, but instead, they become an asset to the electricity grid, and they help the grid 'absorb variations within the energy infrastructure' (Halvgaard et al., 2012). This strategy is further supported by Ipakchi and Albuyeh (2009), who suggest using parked BEV with vehicle-to-grid (V2G) capability to provide additional demand and additional storage facilities to the grid; which would reduce timescales on power distribution, reduce maintenance time and cost, increase efficiency and effectiveness, as suggested by Faessler, Kepplinger and Petrasch (2019).

Opportunities for growth

In summary, the literature review has highlighted the significant regulatory, environmental, and infrastructural challenges that UK businesses face as they transition from ICEVs to EVs. While these challenges are considerable, they also present substantial opportunities for companies willing to adapt. The shift to EVs is not merely a compliance requirement but an avenue for innovation and strategic growth (Cegliński and Wiśniewska, 2016). The transition to electric vehicles should be seen as an opportunity for business growth rather than a burden. The shift offers numerous avenues for cost savings, innovation, and enhanced sustainability credentials (Anthony Jnr, 2021). By electrifying their fleets, businesses can reduce long-term operating expenses. EVs typically have fewer moving parts than internal combustion engine vehicles (Sadek, 2012), resulting in lower maintenance costs. In addition, government incentives and lower energy costs contribute to significant financial advantages.

Beyond cost savings, moving to EVs can strengthen a company's reputation (Bögel,2019). Customers, partners, and investors are increasingly prioritising sustainability, and businesses that lead the way in adopting greener technologies are well-positioned to capture this growing market. The integration of on-site charging stations also provides opportunities to optimise energy use, particularly with smart charging systems that align with off-peak electricity rates (Anthony Jnr, 2021). This not only reduces costs but can also

open new revenue streams.As regulatory pressures mount to achieve Net Zero targets, businesses that embrace EVs can future-proof their operations, positioning themselves as leaders in a low-carbon economy. Ultimately, this transition should be viewed as a strategic investment that enhances both profitability and long-term sustainability.

By embracing electrification, businesses can unlock cost savings, enhance their sustainability credentials, and optimise their energy management practices (Sadek, 2012). The following section will explore these business opportunities in detail, demonstrating how companies can leverage the transition to EVs to gain a competitive edge and drive future success.

Potential Business Opportunities

Cost Savings through Fleet Electrification

By transitioning their fleet to electric vehicles (EVs), companies can benefit from lower operating and maintenance costs compared to traditional internal combustion engine vehicles (ICEVs). EVs typically have fewer moving parts, which reduces the need for frequent repairs and servicing. Additionally, with government incentives and lower fuel costs, companies can significantly reduce their total cost of ownership, freeing up resources to invest in other areas of the business.

Enhancing Corporate Sustainability Credentials

Moving to an EV fleet allows companies to enhance their sustainability profile, which can be used as a competitive advantage. Businesses that commit to reducing their carbon footprint can attract environmentally conscious clients and partners and may also benefit from meeting increasingly stringent supply chain requirements related to sustainability. This shift can strengthen the company's brand image and open new market opportunities that prioritise green practices.

Optimising Energy Usage with On-Site Charging Solutions

By installing on-site EV charging stations, companies can manage their energy consumption more effectively, particularly if integrated with smart charging systems. This allows businesses to take advantage of off-peak electricity rates, reducing operational costs. Additionally, companies can explore offering charging services to employees and visitors, potentially creating a new revenue stream while enhancing workplace amenities.

Areas for further research

The initial literature review highlights that businesses have opportunities to optimise profitability by capitalising on the potential cost savings associated with adopting EVs. Consequently, three key areas are proposed for future research to further explore these opportunities.

1. Maximising Efficiency in EV Fleet Management- Research into advanced fleet management systems tailored for EVs could help businesses reduce operational costs and improve efficiency. By exploring the use of telematics, predictive maintenance, and optimised route planning, companies can minimise downtime, extend vehicle life, and reduce energy consumption. These efficiencies directly translate into cost savings and improved profitability.
2. Integration of Renewable Energy with EV Fleets- Investigating the integration of renewable energy sources, such as solar or wind, with EV fleets could reveal opportunities for further cost reductions. By powering EVs with self-generated renewable energy, businesses can significantly lower their energy expenses. Additionally, selling excess renewable energy back to the grid can create an additional revenue stream, enhancing overall profitability.
3. Assessing the Impact of EVs on Corporate Social Responsibility (CSR) Initiatives- Researching how the adoption of EVs impacts a company's CSR initiatives could reveal ways to enhance brand value and attract investment. Businesses that are seen as leaders in sustainability may benefit from increased investor interest, customer trust, and potentially lower capital costs, all contributing to greater profitability.

Conclusion

The transition to electric vehicles (EVs) in the UK, driven by the government's Net Zero roadmap, presents both significant challenges and substantial opportunities for businesses. As internal combustion engine vehicles (ICEVs) are phased out by 2035, with a ban on new sales by 2030, companies are compelled to rethink their strategies and operations to align with these regulatory demands and the growing emphasis on sustainability from partners and customers.

This literature review has highlighted the potential benefits of adopting EVs, including lower operating and maintenance costs, enhanced corporate sustainability credentials, and opportunities to optimise energy usage through on-site charging solutions. However, it has also underscored the complexities involved, particularly regarding the UK's current electrical infrastructure and the logistical challenges of replacing millions of diesel and petrol vehicles.

For businesses, the move to EVs is not merely a compliance exercise but a strategic opportunity to innovate and gain a competitive edge. By embracing this shift, companies can not only reduce their carbon footprint but also unlock new avenues for profitability. The proposed areas for future research, such as maximising efficiency in EV fleet management, integrating renewable energy with EV operations, and assessing the impact on corporate social responsibility initiatives, offer pathways to further enhance business performance in this rapidly evolving landscape.

In conclusion, while the path to full EV adoption may be challenging, it also provides a unique opportunity for businesses to lead in sustainability, optimise costs, and secure long-term success in a low-carbon economy.

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