UKS31034

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SE4REN INDIVIDUAL ASSIGNMENT 1

Abstract

The number of electric vehicles in the United Kingdom is increasing day by day. The demand for Renewable energy systems is increasing also. Offshore wind turbines can be very useful for the charging of electric vehicles. The United Kingdom government plans to generate 28 GW of wind power by 2023. Offshore wind turbines offer a variety of benefits, including stronger and more consistent winds, improved land utilization, lower noise levels, and lower carbon emissions. Various laws and regulations are implemented by the government of the United Kingdom for better incorporation of wind energy.

Introduction

Background

The possible number of electric vehicles in 2040 in the United Kingdom can be 36 million [9]. According to the report of UK Road Traffic forecasts, 25 million electric vehicles can be increased from 2010 to 2040 [5]. The possible number of electric vehicles in 2030 can be 20 million.

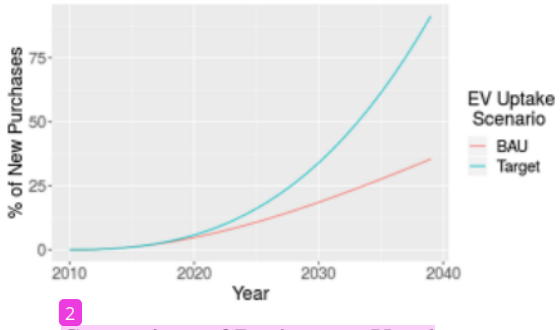

Figure: Comparison of Business as Usual and 2040 EV Adoption Target Scenarios, 2010–2040.

(Source: Hill *et al*. 2019)

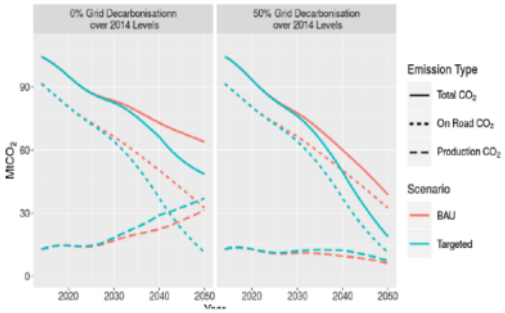

Figure: The change in carbon emissions due to the incorporation of electric vehicles

(Source: Hill *et al*. 20119)

The formula for calculating how much electricity is required to charge an electric vehicle

Electricity requiresd (kWh) = Battery Capacity (kWh)/Charging Efficiency)

In the United Kingdom, Electric vehicles have a capacity of 40 kWh and the charging efficiency is 90% approximately.

The amount of electricity required to charge the electric vehicle = 40 kWh / 0.90 = 44.44 kWh.

In 2010, the amount of electricity required = 44.44 kWh * 10 million = 444,400,000 kWh.

In 2030, the amount of electricity required = 44.44 kWh * 20 million = 888,800,000 kWh.

In 2040, the amount of electricity required = 44.44 kWh * 36 million = 1,599,840,000 kWh.

According to Zap Map, 40496 electric vehicle charging points are situated in the United Kingdom [11]. The number of charging locations is 23,902. It costs around 32p per kilowatt-hour to charge an EV at home. The UK government does offer subsidies for electric vehicle buyers, which provide up to £2,500 off the price of a new electric car.

Aim and objectives

The study aims to analyze EVs and the COP26 declaration on accelerating the transition to 100% zero-emission cars and vans, to understand Short, medium and long-term scenarios of electric vehicles and analyze the impact of these on energy demand, To Propose a REN system to provide the required increase in electricity demand, and To discuss and evaluate proposed REN system.

- To analyze EVs and the COP26 declaration on accelerating the transition to 100% zero-emission cars and vans.
- To understand Short, medium and long-term scenarios of electric vehicles and analyze the impact of these on energy demand.
- To Propose a REN system to provide the required increase in electricity demand.
- To discuss and evaluate the proposed REN system

Electric vehicles are cars or vans that operate on electricity rather than petrol or diesel fuel. They are propelled by one or more electric motors and store energy in rechargeable batteries. People are becoming more conscious of the environmental effect of traditional fossil fuel cars and the benefits of renewable energy, hence EVs have grown in popularity in recent years.

The COP26 declaration on accelerating the transition to zero-emission cars and vans is a pledge made by nations and industry leaders to accelerate the transition to electric vehicles to cut greenhouse gas emissions and prevent global warming [1]. The declaration, signed at the United Nations Climate Change Conference (COP26) in Glasgow, Scotland in November 2021, calls for a phase-out of new

internal combustion engine (ICE) vehicle sales in leading markets by 2035 or earlier, and for all new cars and vans sold globally to be zero-emission by 2040. The declaration also emphasizes the importance of investing in charging infrastructure, research and development, and incentives to stimulate the use of EVs. It asks governments, businesses, and civil society to work together to secure an equitable transition to a zero-emissions future that benefits everyone.

The COP26 declaration is an important step towards a more sustainable future and has the potential to speed the transition to clean transportation. It provides a strong signal to the automobile sector and investors that the future of transportation is electric, and that major effort is required to decrease emissions and mitigate the effects of climate change.

Scenarios for an Increase in EVs

In the short term, The UK government has set a target of prohibiting the sale of new petrol and diesel vehicles by 2030. This would greatly raise demand for electric cars (EVs) in the country, resulting in a rise in the number of charging stations and the development of more inexpensive and efficient EV models. The government is also providing financial incentives, such as grants and tax rebates, to encourage individuals to purchase EVs.

In the medium term, which is expected to last from 2030 to 2050, EVs will become the standard for personal and commercial transportation [2]. As a result, more EV infrastructure, such as charging stations and grid upgrades, will be required to meet the increasing demand. Battery technology will also progress, resulting in more efficient and long-lasting EVs.

In the long term, which is anticipated to be beyond 2050, EVs will be the dominant means of transportation in the UK. With the advancement of more efficient battery technology and renewable energy sources such as solar and wind power, EVs will become even more environmentally benign and cost-effective. The infrastructure supporting EVs will also be well-established, with charging stations and grid improvements widely available across the country.

Impact of Short, medium and long term of EV on electric demand

In the short term, Increased EV demand will almost certainly result in a minor rise in power demand in the UK. This is because EVs require power to charge their batteries, and as more people transition to EVs, the

demand for electricity from charging stations will rise.

In the medium term, The impact on power usage will be greater. As more EVs hit the road, the power demand will skyrocket. Significant investment in the power system will be required to guarantee that it can manage the increasing demand [3]. This increasing demand, on the other hand, might be viewed as an opportunity for the UK to transition to a more renewable and sustainable energy system.

In the long term, The effect on the consumption of electricity will be significant. Electricity usage will skyrocket as EVs become the dominant means of mobility. However, with battery technology developments and the growing usage of renewable energy sources such as solar and wind power, the electricity demand from EVs may be fulfilled sustainably. The shift to a more sustainable and renewable energy system will be important in ensuring that the increasing electricity demand from EVs does not harm the environment.

Renewable energy and low carbon technology (REN) system

Proposed System

Offshore Wind farms can be a useful REN system and it will be very beneficial for the charging of electric vehicles. The system's principal component would be offshore wind turbines, which would be moored to the seabed and create electricity as the wind spun the blades. Electricity generated by the wind turbines would be transferred to shore through subsea cables. These cables would have to be built to survive the harsh offshore climate and buried to prevent damage[7]. The submarine cables would link to an onshore substation, where the power would be transformed to a higher voltage before being delivered to the grid. Because wind energy is intermittent, energy storage devices that can store extra energy during periods of high wind production and release it during periods of low wind output are essential. This can be achieved through the use of battery storage or other technologies. To guarantee that the wind energy system operates effectively and safely, monitoring and control systems would be required. These technologies can also aid in the optimisation of energy output and the reduction of maintenance expenses [8]. Offshore wind farms have the potential to

influence local ecosystems and species. It is critical to undertake a thorough environmental impact assessment to detect and minimize any consequences. Offshore wind farms can be a cost-effective and environmentally friendly approach to fulfilling energy demands while lowering greenhouse gas emissions.

The amount of electricity required for the potential number of Electric Vehicles (EVs) up to 2040 would be determined by numerous factors, including the number of EVs, battery sizes, charging infrastructure, and charging habits. As a result, providing a specific estimate is difficult. However, according to research by the UK Committee on Climate Change (CCC), the power requirement for EVs in the UK might rise to roughly 50 TWh by 2030 and up to 200 TWh by 2050. These estimates assume that EVs are widely used in the UK and that most charging takes place at home, at work, or public charging stations. In 2023, the United Kingdom government is generating 28 GW of wind power.

Discussion and Evaluation

Offshore wind turbines provide various advantages, including stronger and more constant winds, better land usage, decreased aesthetic effect, lower noise levels, and fewer carbon emissions. They do, however, have certain drawbacks, including greater costs due to the additional engineering required for installation and maintenance, as well as limited availability due to the requirement for specialized boats and equipment. Despite these obstacles, offshore wind turbines are becoming a more important source of renewable energy as governments strive to switch to clean energy sources and decrease carbon emissions [6]. Offshore wind turbines have the potential to play a big part in fulfilling the world's rising energy demands with ongoing investment and innovation.

Policies and Proposals

The United Kingdom has various laws and initiatives concerning wind energy, which is an important component of the country's renewable energy mix [4]. The Contracts for Difference (CfD) scheme, gives financial support to renewable energy projects such as onshore and offshore wind farms. The government has also established offshore wind capacity objectives, aiming for 40 GW by 2030, and has initiated a series of offshore wind auctions to promote investment in the industry. Furthermore, the United Kingdom has enacted planning laws that encourage the growth of wind energy, such as a presumption in favour of sustainable development for wind projects.

Conclusion and Recommendations

In recent years, the EV (electric vehicle) industry has grown significantly, with governments and automakers pledging to reduce emissions and promote the use of electric cars. Electric cars have apparent advantages in that they release fewer greenhouse emissions, need less maintenance, and can be more cost-effective in the long term. The 2021 United Nations Climate Change Conference, commonly known as COP26, was held in Glasgow, Scotland, to accelerate action towards the Paris Agreement's goals. The COP26 declaration asks for immediate and bold action to solve the climate catastrophe, with an emphasis on lowering greenhouse gas emissions and keeping global warming to 1.5 degrees Celsius.

- Governments should establish aggressive objectives for the phase-out of new petrol and diesel car sales and stimulate the purchase of EVs through tax breaks, grants, and subsidies.
- Automakers should continue to invest in R&D to develop EV battery technology, lower costs, and extend EV range.
- To maximize range and reduce the environmental effect, consumers should educate themselves on the benefits of EVs, schedule their charging, and drive efficiently [8].
- Governments should set strong and quantifiable goals for decreasing greenhouse gas emissions, particularly those from transportation.
- Individuals should live more environmentally friendly lives, such as taking public transit, bicycling, and walking, and minimising waste and consumption.
- The international community should collaborate to mobilise funding and technology transfer to assist poor nations in making the transition to low-carbon and climate-resilient economies.

Reference List

Journal

[1] Nikolakakis, T., Bozkir, E.D., Chattopadhyay, D. and Merino, A.M., 2023. Analysis of Long-term Variable Renewable Energy Heavy Capacity Plans Including Electric Vehicle and Hydrogen Scenarios: Methodology and Illustrative Case Study for Turkey. IEEE Access.

[2] Bayram, I. S., Zafar, U., & Bayhan, S. (2022). Could petrol stations play a key role in transportation electrification? a gis-based coverage maximization of fast ev chargers in urban environment. *IEEE Access*, *10*, 17318-17329.

[3]Said, D., Elloumi, M., & Khoukhi, L. (2022). Cyber-attack on P2P energy transaction between connected electric vehicles: A false data injection detection based machine learning model. *IEEE Access*, *10*, 63640-63647.

[4] Shaaban, M.F., Mohamed, S., Ismail, M., Qaraqe, K.A. and Serpedin, E., 2019. Joint planning of smart EV charging stations and DGs in eco-friendly remote hybrid microgrids. IEEE Transactions on Smart Grid, 10(5), pp.5819-5830.

Guzović, Z., Duić, N., Piacentino, A., Markovska, N., Mathiesen, B.V. and Lund, H., 2022. Paving the way for the Paris Agreement: Contributions of SDEWES science. *Energy*, p.125617.

[5] Hill, G., Heidrich, O., Creutzig, F. and Blythe, P., 2019. The role of electric vehicles in near-term mitigation pathways and achieving the UK's carbon budget. Applied Energy, 251, p.113111.

[6] Bennett, R., & Vijaygopal, R. (2018). An assessment of UK drivers' attitudes regarding the forthcoming ban on the sale of petrol and diesel vehicles. Transportation Research Part D: Transport and Environment, 62, 330-344.

[7] Guzović, Z., Duić, N., Piacentino, A., Markovska, N., Mathiesen, B.V. and Lund, H., 2022. Paving the way for the Paris Agreement: Contributions of SDEWES science. *Energy*, p.125617.

Olmez, S., Thompson, J., Marfleet, E., Suchak, K., Heppenstall, A., Manley, E., Whipp, A. and Vidanaarachchi, R., 2022. An Agent-Based Model of Heterogeneous Driver Behaviour and Its Impact on

Energy Consumption and Costs in Urban Space. *Energies*, *15*(11), p.4031.

Website

[9]nationalgrid.com, "Keeping 36 million electric vehicles on the move" Available At: https://www.nationalgrid.com/electricity-transmission/Keeping-36-million-electric-vehicles-on-the-mov#:~:text=By%202040%20there%20could%20be,stations%20dotted%20around%20our%20motorways

[10]edfenergy.com, "Road tax & company car tax on electric cars" Available At: https://www.edfenergy.com/electric-cars/tax-road-company#:~:text=Tax%20on%20benefits%20in%20kind,2%25%20in%202022%20%2F%2020

[11] zap-map.com, 2023 "EV Charging Statistics 2023" Avaiable At: https://www.zap-map.com/statistics/

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