**Electric Vehicles: Problems and Possibilities**

1S M Nazmuz Sakib (Orchid- <https://orcid.org/0000-0001-9310-3014>) ([sakibpedia@gmail.com](mailto:sakibpedia@gmail.com))

1 Graduate of BSc in Business Studies

School of Business And Trade

Pilatusstrasse 6003, 6003 Luzern, Switzerland

1 Student of BSc in Civil Engineering

Faculty of Science and Engineering

Sonargaon University

147/I, Green Road, Panthapath, Dhaka

1 Student of LLB(Hon’s)

Faculty of Law

Dhaka International University

House # 4, Road # 1, Block - F, Dhaka 1213

1 Student of BSc in Physiotherapy

Faculty of Medicine

University of Dhaka

Nilkhet Rd, Dhaka 1000

# 1Author Biography

# S M Nazmuz Sakib is an eLearning expert and done more than 500 MOOCs or Massive Open Online Courses and experienced as an instructor in sites like Udemy. He has completed his BSc in Business Studies from School of Business And Trade, Switzerland with CGPA 4 in the scale of 4 and 97.06% grade marks on an average. He is also a certified Google IT Support Professional, Google Data Analytics Professional and IBM Customer Engagement Specialist Professional.

# 1

**Abstract**

Scientists and engineers are pondering on possibilities to invent reliable energy sources for electric vehicles. Academics and researchers are conducting researches to propose feasible changes in EV industry and their manufacturing. Lack of powerful batteries and scarcity of charging infrastructure is one of the major impediments in the ways of this technology. Many researchers have proposed a number of possibilities to overcome this challenge.

**Keywords***: Wireless Power Transfer, Battery Swamp Stations, Electric Drivers, AI Technology*

**Introduction**

Electric Vehicles (EVs) are vehicles that are fully and in some cases partially powered on electricity. Such vehicles are getting into the market robustly because of their low running cost and environmental friendly features. Since this technology is comparably new in the market, engineers are trying to find ways to improve EVs functions and running capacity. Some EV engineers use nickel metal and lead acid batteries, but nowadays lithium-ion batteries are considered standard for these cars as such batteries are greater at retaining power. Despite these improvements, experts are showing concerns about the safety of these batteries because these can experience thermal run away and caught fire. Recently such an incident took place in a Tesla Model S car. EVs industry is a growing one, scientists and engineers are conducting researches in the field to find ways to improve it. The main concern about these cars is to improve their battery lives.

**Literature Review**

EVs are gaining ground due to their climate friendly features. Zero emission, Simplicity and reliability are advantages of electric vehicles **(Fransico J. Martinz** *et al***, 2021)**. Battery powered EVs are minimalist in a way that they have 99% fewer moving parts as compare to cars running on fossil fuel and PHEVs. One shortcoming on engineers are working on is that BEVs’ batteries are not powerful enough to continue long journeys, especially in hilly areas. The range is a real concern for BEVs, but improvement in this field says much about the future longevity of electric vehicles. The authors of their research argued that more than twice energy required to produce an electric car as compared to a combustion engine, more specifically, because of the production cost of batteries. Battery production needs extracting minerals and rare earths to be used in this industry. Another hindrance in the way of EV batteries is that when they reach at the end of their lifespan they may become environmental hazards. Recycling of batteries is essential for the implementation of this transport technology.

Wireless Charging, Battery Exchange and Conductive Charging methods are three important techniques of charging EV batteries (**Kristian Jensen** *et al***, 2021**). Pantograph charging and overnight charging are also part of conductive charging method. Wireless charging or Wireless Power Transfer (WPT) uses two coils and is based on electromagnetic generation. Recently this technology got attention because it can charge the vehicle while on motion and it does not need a standard connector. Other important source of charging EVs is Battery Exchange from Battery Swamp Stations (BSS). In this method, users exchange EV batteries in swamp stations and take batteries from there on rent. BSS need large stock of batteries because such stations provide batteries for general users. While conductive charging method (CC) is a complex technique, it provides high efficiency V2G facility and maintain voltage level. Charging is one of the biggest impediments in the way of EV technology to replace combustion engines.

It is evident by world governmental policies that they are trying to adopt environmental friendly means of transportation. Governments pushing and subsidizing industries to innovate newer and more reliable electric cars to mitigate climate change. This pressure from governments and climate activists is forcing industries to build engines that are propelled by renewable energy. Electric means of transportation is one of the most concerned fields of transformation. Currently there are three type of vehicles on the roads, Electric Vehicles, Semi Electric or Hybrid Vehicles and Combustion engines. Since fossil fuel engines are being replaced by electric vehicles, this transformation requires a wide range of infrastructure to produce batteries and for charging stations. It will have a considerable impact on electric power industry (**Flipi Joel Soares** *et al,* **2011**). In their research Flipi J. Soares et al describes how demand of Electric Vehicle is transforming power sectors to modify itself accordingly. They predict that the replacement of fossil fuel vehicles by electric ones will require specific local charging stations, these charging stations include stations for fleets, Fast Charging stations, and Battery Swamping stations (BSS) and charging stations for domestic users for slower charging. This is a huge challenge which needs to be considered while transforming transportation technology.

Market demand for Electric Vehicles and use of green energy for transportation means have led researchers to investigate and find ways of transformation. Electric Vehicle industry is undergoing a huge transformation due to the general demand for electric cars. Researchers are trying to meet these demands and make it feasible for every user to have access on advance batteries, electric drivers, level3 fast charging system (**Wislon Ebrele** *et al***, 2013**). In this research Wislon Ebrele points out many possible changes in the Electric Vehicle industry. The authors state that resonant antennae power transfer (RAPT), pioneered by Nikola Tesla, is useful method for charging electric vehicle batteries without wires. This method uses two or more resonate antennae linked with same frequency. These tools have often large coils helical with controlled separation between the turns. Power transfer is possible using this method at a distance of about 10 m, which is acceptable.

Installation of AI technology in EVs is a very helpful method to communicate and connect with other vehicles. Vehicle to Vehicle (V2V) communication reduce chances of accidents and will open a wide range of opportunity in the future modification and development of EVs. Engineers working on EV projects proposed several suggestions to improve battery thermal management, charging points and efficient routing. Machine learning method for efficient routing was proposed by (Masikos M et al, 2013). Their approach enables the EV through AI technology to predict energy consumption for road segments. (**Islam SM** *et al***, 2015**) Proposed the use of Artificial Neural Networks (ANNs) to detect daily load of vehicle and fleet on the roads to collect data. To be precise, RNN technology uses this data to predict demand of electricity and coordinate in a better way.

**Conclusion:**

Electric Vehicles technology is a growing one undergoing transformation rapidly. Researchers are busy to investigate available data on the topic and proposing creative ways to transform this industry. Fransico J. Martinz et al argue that zero emission and climate friendly features are the reason behind the general acceptability of EVs. Charging and battery capacity of these EVs is another topic of concern on which Cristian Jensen et al conducted a comprehensive research. Availability of Charging stations, recycling of expired batteries and producing a huge amount of powerful batteries impact the climate of earth. Flipi Joel Soeres also agrees with Cristian Jensen and argues that charging points and battery production are the main hindrance in the way of EVs. As EVs can also be self-driving which need state of the art AI algorithm to be installed in EVs. Islam SM et al propose the use of RNN network in electric vehicles to enable communication between them through this technology.

Electric vehicles industry is a progressing one and engineers are innovating state of the art vehicles. But this industry is nascent compare to fossil fuel engine industry. To overcome shortcomings of the industry and to meet with challenges, engineers and scientists are creating new technologies. One hopes that in the coming days this industry overcome all challenges.

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