



Electric Cars, Challenges and Benefits

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Abstract

The history of mobility dates back to ancient times, when man invented the wheel, which laid the foundation for important economic and political processes. In parallel with the development of civilization, the existing mechanism was refined and humanity as a result received cars with the type of internal combustion engine. In the XXI century, the automotive industry faces new challenges as the traditional automobile gradually begins to run out of its own resources, it became necessary to look for alternatives. The latter has also been facilitated by global economic transformations and its digitization. This innovation goes through many stages of development; therefore, it faces many problems that need to be solved. The issue of how to refine the mechanism in electric cars is on the agenda.

Keywords: Electric cars; Mobility; Digital economy; Ecology; Innovation; Charging stations; Element technology

Introduction

Many centuries ago, mobility for man was associated with freedom and novelty. In the search for constant development and innovation, mankind invented a colossal number of vehicles, and these inventions went through many stages of development and adaptation, resulting in one of the most important innovations in the XIX century, known as the electric car. In the context of globalization, large-scale economic, political, social and environmental transformations have taken place that have not gone unnoticed for the automotive industry. Constant changes in resource supply and prices, trade barriers and fuel price fluctuations have put car manufacturing companies in a new reality.

The purpose of this study is to identify the key elements that will contribute to the introduction strategy of electric cars.

Results and Analysis

Technological process and ecology

Changes and innovations in field of technology were the first sign that “mutations” would occur in the automotive sector as well. More than forty electronic controllers, various software and innovative approaches make the car even smarter and more sophisticated. Technological perfection has had a great impact on two important features of the car:

- a) Fuel economy and reduction of harmful emissions.
- b) Ensuring safety and comfort by improving the exterior and interior.

The constant emissions of internal combustion and diesel engine-type vehicles, increasing the amount of harmful and asphyxiating gases in the air, have led to global warming. Figure 1 shows the statistics of emissions by vehicles by years and also the future forecast for 2070. It seems that the amount of carbon dioxide is at its peak for 2017-2020. This is one of the main reasons why humanity has begun to look for alternatives for relocation that, in addition to economic growth, would lead to an improvement of the living standards and the environment. In addition to companies and consumers, the interest in electric cars is great from the states as well. They adopt different policies for promoting electric cars; they subsidize projects related to the development of this segment. For example, countries like England and France plan to ban the sale of internal combustion engine cars after 2040[1]. By 2022, citizens in America will be able to purchase 127 different models of electric cars [2]. Over time, people’s attitudes toward electric vehicles become more positive. It is also noteworthy how much impact it will have on reducing noise pollution in the environment. The reasons why electric cars have not been introduced in real life for so long are various, but two main aspects are noteworthy: the lack of charging stations and the lack of off-road by cars, but nowadays

these obstacles are slowly disappearing, since the infrastructure is improving.

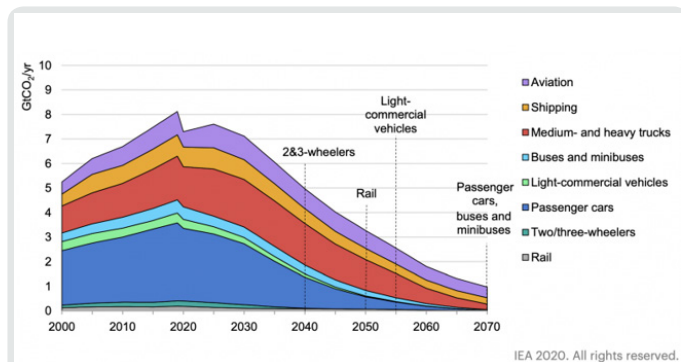


Figure 1: Global CO₂ emission according to vehicles, sustainable development scenario 2000-2070 years. Source: International Energy Agency.

In order to fully replace petrol and diesel cars with electric cars, it is necessary to refine the battery and its systems. The above component is being studied and improved. The automotive industry nowadays has several types of battery that can be used in automobiles. The following types of batteries are noteworthy [3]:

- a) Lead-acid batteries (Pb-PbCO₂)
- b) Nickel-cadmium batteries (Ni-Cd)
- c) Zinc-bromine batteries (Zn-Br₂)
- d) Sodium chloride and nickel batteries (NA-NiCl)
- e) Sodium sulfur batteries (Na-S)
- f) Lithium-ion batteries (Li-Ion)

In order to compete with cars with an internal combustion engine type, the electric vehicle battery system needs to pass many exams.

Smart city and its infrastructure

In addition to battery optimization, one of the most important issues for electric cars is the infrastructure and the regulation of its characteristics. In order to popularize this type of cars, the charging system needs to be simple, fast and high quality, which provides long distance travel with less time costs. When it comes to charging systems, it is necessary to mention types of power:

- a) Direct current
- b) Alternating current

The commercial success of electric cars, of course, depends on the improvement of the infrastructure. No one wants to replace a traditional car if the charging stations are not in order, because for consumers, electric cars, in addition to being environmentally friendly, should be associated with comfort and a step forward in the field of mobility; Infrastructure needs to be strategically allocated in order customers to be satisfaction. The charging method that is most widely used today is home-installed charging

devices that offer users slow charging, although this is not enough for the system digitalization.

There is an active debate nowadays about what the charging infrastructure of the future should look like, as the commercialization of electric cars depends on the reliability and speed of the charging devices. Various charging offers are considered:

- a) Plug-in Charging, which is the most common method. Despite its scale, charging a car battery with this method is associated with certain difficulties, such as time consumption as well as lack of charging stations.
- b) Wireless Charging, which envisages charging the car battery in a contactless way. When using this method, the car is charged with the help of electromagnetic field, however this method is new and its use in real life is still in process.
- c) Battery swapping, which envisages charging a car by replacing a new battery. Of course, such a methodology is fast, but its disadvantage is that the battery has to be replaced at special stations, which is a rarity today.

When talking about the challenges of a charging infrastructure, it needs to be considered from both the manufacturer and the consumer sides; Cooperation is necessary, otherwise failure of this project will be inevitable; Properly considering issues such as the location of charging stations, availability, what payment methods will be, charging fees, how infrastructure will be managed, etc. will play a critical role. Smart cities are one of the most important and large-scale topics in the digital economy. It envisages smart governance, economics, mobility, education, and so on. The development of technology and the rise of urbanization have created a new puzzle for people, particularly how to create a new "ecosystem" and its management, and the optimal solution to this problem has been found in smart cities and smart technologies. The development of the Internet and technology has led to the development of projects such as smart grids, which facilitates smart and economic distribution of electricity. The blockchain system, artificial intelligence and the Internet play a big role in these processes. With the help of smart grids, it is possible to establish a sustainable power system with the participation of numerous applications and sensors to ensure proper data processing and optimization of electrification.

Smart grids, unlike the standard electrification system, use a radically different approach. With the standard approach the user only consumes the resource and in return for this resource he pays the fee, while with the smart approach the user not only consumes electricity but also participates in the utilization of the grid. Utilization involves both the consumption of electricity and its transmission to the grid, and the electric vehicle contributes to this process, as its elements are arranged not only for consumption but also for the accumulation of energy and, if necessary, for delivery. There is a kind of cooperation between smart grids and electric cars, for the integrity of the system.

Georgia

The issue of electric cars is gaining relevance in Georgia as well, however, at this stage it can be said that the Georgian market is still scarce. The region consumes massively gasoline and diesel cars. According to 2018 data, 624 electric cars were registered in Georgia, and in 2019 – only 822 units [4]. As for hybrid cars, according to 2019 data, 23,063 cars were registered in Georgia. The number of charging stations in Georgia is also few, but this is natural because the market is not ready for electrification [5-13]. Currently, there are several free public charging stations in Georgia, and there is only one company in the private sector that provides charging stations.

Conclusion

In conclusion, it can be said that the potential of electric cars is great, though in present they face many challenges; It is necessary to mobilize resources around the research topic and to perfect it. The integration of electric cars into the digital economy will enable humanity to take the field of mobility to a new level of development, which will make a huge contribution in solving many global issues.

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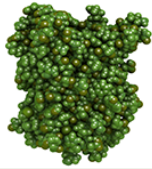
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