Analysis of Current Situation, Problems and Potential Solutions of Electric Vehicle Industry

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Abstract. The onset of the 21st century has seen remarkable developments in almost every industry in our modern-day world. Technology develops the quality of life and grows at an unprecedented rate. During the long run, newly type of vehicles is innovated, and new energy vehicles are an important development direction. Electronic vehicle (EV) not only is a production of the new era, but also a process of the evolution. The first EV appeared in late of 1830s which also be the prototype of the EV of nowadays. Currently, EVs are commonly used by individuals, the reason that EVs are more environment friendly, with the fuel less costly, and get government' beneficially. However, EVs still have issues in nowadays, i.e., installation, short range, and battery handling. To solve these issues, the public could offer more installation charging piles, and EV companies could improve the battery capacity and maintenance. Overall, the reports will illustrate the current status and current problems that EVs faced, also showing the solutions and the recommendations to help the EV industry to develop.

Keywords: New Energy Vehicle; Charging Pile; Lithium-ion Battery.

1. Introduction

The hybrid vehicle has already formed a popular market in the past few years, and the fully electric vehicle seems becoming popular as well. Considering environment protection, the government implemented many positive policies and welfare for owning an electric vehicle. The economy for the electric car is cheaper than owning a gas vehicle since most governments' incentives are only for purchasing an electric vehicle. Moreover, most vehicle industries and car makers also followed the policy and focused harder on producing a better electric vehicle model. The quality of electric vehicles is getting better and better, and almost all the tests between the two major types of vehicles showed the electric car is better than the gas one such as the crash test, safety test, and system test. With the good quality of the electric vehicle, the maintenance cost is also lower than the gas vehicle surprisingly. Therefore, more people consider owning an electric vehicle compared to a gas vehicle nowadays.

2. Current status

The paper will show the current status of electric vehicles in terms of sales, price, and trend.

2.1 Current sales

According to Global EV Outlook, the electric car market grew significantly between 2012 and 2022. Sales of EVs (electric vehicles) are continuing to break records year by year. There are about 16.5 million electric cars driven on worldwide roads in 2021 while only about 120,000 electric cars were sold back in 2012 [1] . The main reason for the success of EVs is mainly because of the policy support that is implemented by many countries such as China, the United States, and the European Union. Many countries have ensured to put more incentives and research subsidies in the relative area

of EVs. Moreover, with the introduction of the new different electric car models that keep growing faster, consumers would have more choices to choose between the EVs, and that caused the consumers to have more probability of having an electric car. In addition, electric vehicles usually have better qualities than comparable gas-engine vehicles. EVs usually have better performance on speed and acceleration than gas ones, and that attracts many car enthusiasts. Therefore, more companies and carmakers have plans to focus more on manufacturing EV components and car models.

Additionally, the debate between proponents of electric cars and gas ones is still an ongoing topic nowadays. However, more people seem to agree that electric cars are better than gas ones. The number of electric car sales also approved of this phenomenon. Because of carmakers' deeper development into electric car components and government propaganda, more people are aware of the high quality of an EV. There are several advantages to having an electric car in recent years. Firstly, some government policies are discouraging citizens from purchasing gas cars, especially the countries whose economy depends largely on exports of oil. If more citizens choose to have an EV instead of a gas vehicle, the demand for oil imports will decrease significantly, the environment will become better since there's less carbon dioxide production from vehicles, and the government has more money to invest in other fields and projects. Secondly, EVs often cost less for maintenance. Although electric car batteries are more expensive, their usage time usually lasts longer than gas engines. Consumers who own an electric car could change batteries less frequently than those owning a gas vehicle.

2.2 Price

There are plenty of reasons to own an EV, but the price is still a main considerable factor before purchasing the EV. The conclusion is the EV owner still wins out the competition with the original gas vehicle owner. The first reason is the government incentives. For instance, almost every state in the United States and utility companies offer incentives to own a new EV. Although different states and utility companies provide different incentives, they still reduce the price of purchasing an EV. The second reason is the cost of fuel price and the cost of maintenance. According to a 2020 Consumer Reports study, the average cost to fuel an EV was almost half as much to drive a gas vehicle [2]. Also, the EV cost half as much to maintain and repair as gas-powered cars. Therefore, the future cost of owning an EV is way cheaper than owning a gas vehicle.

2.3 Current trend

Recently, environmental protection is widely encouraged in the modern-day world, a "positive environment" sign attracting individuals when they make purchase decisions. According to DeWitt, 85% of individuals are willing to get an EV (electronic vehicle) because of its positive environmental impact. Otherwise, the main reason is that the gasoline price dramatically rose recently, and EVs are not correlated at all [3]. This paper surprisingly finds the average national retail price of gasoline is $4.59 a gallon in the U.S.; compared to the same time last year, the inflation in gasoline prices is increasing by 44% shown by the U.S. Bureau of Labor Statistics (BLS) [4]. Sharply price growth of gasoline leads people to be more likely to invest in an EV as much as reduce gas expenses in daily life. Moreover, buying an EV could get a government grant as a federal income tax credit of up to $7500 in the U.S. [5]. Rather than purchasing other types of vehicles, EVs could help to reduce the income tax effecting beneficial and attractive to individuals. Lastly, social media taking place in the purchase trend in the modern-day world. For example, Tesla invents the gull-wing door on Model X and uses advertising on Tiktok, Instragam stories, Facebook, etc. to attract consumers. Furthermore, people would like to post videos on social media which be widely shared with their friends and relatives. These fancy designs are complemented by people who watch the ads or videos on social media that will stimulate purchasing trends.

3. Problems

Nowadays, new energy vehicles occupy a place in the global automobile market. Especially in European countries, the purchase of new energy vehicles is increasing year by year. It is undeniable that the technology and after-sales service of new energy vehicles are gradually developing towards a good trend, but the industry still faces many problems that still need to be solved.

3.1 Installing charging piles

Most Chinese families have a house age of 30 to 40 years. However, the area of these old communities is not large, and even the parking space is insufficient. It is a problem for residents to park in the community. In this case, it is even more difficult to add charging piles for new energy vehicles in the community. New energy vehicle owners without charging piles in the community can only continue to use gasoline as fuel. New energy vehicles have not achieved their original intention of environmental protection and energy saving, nor have they played their maximum role. Moreover, this problem has brought certain restrictions on the sale of new energy vehicles to a certain extent. If the buyer considers that the charging pile cannot be installed in his/her community, he / she will probably choose to buy a car that uses traditional gasoline as fuel.

3.2 Short Range of New Energy Vehicles

This is the second problem faced by new energy vehicles. The range of a gasoline vehicle with a full charge of fuel is about 700 kilometers and 800 kilometers, while the range of a new energy vehicle with a full charge of fuel is only about 300 kilometers, which is less than one third of that of a gasoline vehicle. Moreover, with the increase of the use time of new energy vehicles, the battery will accelerate aging, and the range may continue to be shortened. Although the fuel cost of new energy vehicles is lower than that of oil vehicles, the cost of repeated charging may not be a small amount. The problem caused by battery loss is that the battery needs to be replaced.

3.3 Battery Handling

The original intention of the invention of new energy vehicles is to reduce carbon dioxide emissions, so as to reduce air pollution and help alleviate the problem of global warming. However, if the battery is not recovered in time or not properly handled, the pollution problem may be more serious. Dead lithium-ion batteries which are not properly recycled will seriously pollute the land. With the reference to LCA (Life-Cycle Assessment) results, SiNW material, as a substantial material for manufacturing lithium-ion batteries has been potentially causing 15% of global warming and 10% of the potential cause of human poisoning [10]. At present, the recovery rate of new energy vehicles has not reached 100%, even if the treatment and recovery of batteries need to be paid attention to.

3.4 The safety of new energy vehicles

Finally, this is the most important question that we need to pay most attention to. The premise for people to choose mobility tools is that they are safe enough, with fewer accidents and low casualty rate. However, in recent years, the problem of spontaneous combustion or explosion of new energy vehicles has occurred frequently. According to Jiang et al., Charging safety issue of the electric especially the increasing EV fire accidents has been frequently happening world widely so that it leads to more attention from people [9]. Recently, there was a sensational spontaneous combustion event of new energy vehicles in China, which caused facial disfigurement of the parties. Some models of new energy vehicles are recycled in large quantities. This discourages many consumers who want to buy new energy vehicles and gives up the idea of buying them. The occurrence of these vicious events makes us have to pay attention to whether the technology of new energy vehicles is mature.

4. Potential solutions

The four main problems about new energy vehicles are basically all about the batteries of the new energy vehicles. Therefore, the solutions are based on solving problems of the batteries.

4.1 Installation of Charging Piles

One potential solution to the lack of charging pile issue can be installing more charging piles in the public places usually populated with energy vehicle users. According to Wang, Chi, Xu, and Li, one of the most comments consumer made about new energy car is the related to its charging issue [6]. The consumers prefer to enhance the development of the infrastructure for charging, including the setting up of private charge piles and the setting up of public charging stations. For example, it is possible to install charging piles in an underground park of the supermarket, where is populated with vehicle users. The underground park normally has adequate place for installing facilities such as the charging pipes for new energy vehicles. The user can park and charge their new energy vehicle each time they go to supermarket. Another place for installing those charge piles should be work- place because the users need to drive during weekdays to work and their new energy vehicles will be parked throughout this total period of work time. Charging can be carried out with this period of time. Also, the other choice for installing charging piles is setting them up along the expressway. At the expressway, electricity is consumed at a high rate. Therefore, installing on expressway is useful for electric vehicle users, who cannot get their cars charged properly at home,

4.2 Increase Charging Frequency or Battery Capacity.

One potential solution to this problem is similar to the solution of the first problem, where new energy vehicles are charged at public places. By increasing the amount of these charging pipes regulars through distance will also increase the frequency of being charged for electric vehicles, which eventually will make the time of endurance of the power larger. Alkawsi et al. pointed that opportunity charging stations can be set up at a shop, restaurant or schools which increases the chances for new energy vehicles to be charged [7]. This is a method which enables drivers to charge their cars more frequently since the charging stations are more scattered distributed instead of being centralized in certain places. Another way to increase the time of endurance is to add another battery in each vehicle. The new energy vehicle can be re-constructed to be capable of containing two or more batteries, which will increase the total capacity of the batteries and thus, increase the time of endurance. Another way of increasing the battery's continuation of the journey is to control the heat of the battery. According to, Xia et al. cited in Sharma et al. Nickel-cadmium battery are introduced to be able to have a longer battery life, and a relatively low operating temperature [8]. As the battery heat up, more electricity will be turned into thermal power which is useless and will result in a greater cost of power. Just like what a computer has. A fan can be inserted to the vehicle to control the increase in the temperature of the battery, which helps preserving power for a greater time and distance of journey.

4.3 Establishment of Battery Stores

The third problem of new energy vehicle is the recycling issue of the battery. Mishandling the Lithium batteries can cause pollution. The Lithium batteries of new energy vehicles must be degraded to prevent from pollution. A group professional to degrading batteries can be formed to tackle this problem because the battery now is highly demanded for new energy vehicle users. Also, the batteries used up cannot be randomly abandoned because of the risk of pollution. In order to allocate those batteries, electric vehicle users needed to go to a place to buy new batteries and leave the old one instead of just throwing it. In order to serve this purpose, public battery stores need to be established for both selling new Lithium batteries while collecting and preserving old ones from users. According to Alkawsi et al. BES are the stations for exchanging batteries for drivers of electric vehicles, which benefited the driver to conveniently replace their dead cells with new ones [7]. These stations do not

only bring convenience to the users of electric vehicles, also prevent the environment from the erosion of dead batteries.

4.4 A Compulsorily Regular Car Inspection and Maintenance

The quality of the Lithium battery within the electric car is not 100 percent guaranteed that It might lead to accident like battery liquid leakage. In order to prevent or to lessen the possibility for these safety concerns to occur, a vehicle inspection and maintenance of the lithium batteries need to be carried out for future use of the electric vehicle. The driver's time of buying these cars are recorded by the official seller of these cars and thus their time of getting car inspection and maintenance at which he has bought the car. The maintenance of batteries and cars need to be compulsory within a fixed amount of time to ensure its safety.

5. Conclusion

New energy vehicles (NV), as an evolutionary new product have been popularly utilized by people in daily life. It has brought many benefits to the sustainability of the society including a lessening pollution and saving the energy resources of fossil fuel. Despite its benefits, many concerns toward new energy vehicles are still pointed in this article. These problems include but not limited to the lack of adequate charging piles installed for these vehicles, the incapability of the new energy vehicles for serving at a long range, the lack of endurance of the batteries and the uncertainty in safety issues related to the vehicle. The potential solutions to these problems are also listed. More installation charging stations might be made available by the general public to help resolve the lack of charging piles, and EV manufacturers could increase battery capacity to increase endurance of the vehicles. Also, maintenance and inspections should be enforced at regular interval to guarantee safety of the cars. To sum up, the article has revealed the current situation and issues that EVs are confronted with, as well as the remedies and suggestions to support the growth of the EV sector.

China is currently the most rapidly developing country in the electric vehicle industry. An implication to the future effect of new energy vehicles is that they may successfully substitute the current way of transportation and become vital equipment in our life. This report only focus on addressing the current problems of new energy vehicles but it has not provided a precise study on the future development of electric vehicles in China. This article also has not pointed the advantages of using electric vehicles compared to traditional transportation tools. The utilization of electric vehicles on other aspect apart from being private cars for civil use are not pointed in this report as well. Deeper studies in electric vehicles and predictions of future climates of the electric vehicles in China are suggested.

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