Advances in Economics, Business and Management Research, volume 215
**Proceedings of the 2022 7th International Conference on Social Sciences and Economic Development (ICSSED 2022)**

# How to Eliminate the People's Prejudice Against Electric Vehicles

Yishen Zhang[1,*]

[1] *Department of Financial Analysis Risk Management, University of Waterloo, Waterloo, 32 Austin Drive Waterloo, Canada*
[*]*Corresponding author. Email: y3378zha@uwaterloo.ca*

**ABSTRACT**
With the development of society, more and more people are gradually realizing the importance of automobiles. Automobiles are not only an important means of transportation for people, but also a manifestation of the improvement of people's quality of life. Therefore, through the development of automobiles, readers can see the development prospects of human society. The emergence of new energy vehicles has further promoted the development of the social economy and played a very important role in accelerating the transformation of the automobile industry in various countries. Moreover, while new energy vehicles bring convenience to people's travel, energy consumption and atmospheric pollution are greatly reduced, which is an important breakthrough to accelerate the birth of the new energy technology revolution and promote the transformation of the automobile industry. This paper expounds on the advantages of new energy vehicles from the perspectives of energy consumption, battery life, safety, and carbon emissions of new energy vehicles. Therefore, these aspects can prove the benefits of driving electric vehicles. From the perspective of energy consumption, first, from the chemical energy consumption of fuel, the chemical energy consumption of pure thermal power electric vehicles is only half of that of fuel vehicles. Second, the unit energy transfer loss from the finished energy (gasoline/electricity) to the car is only 1/5 to 2/3 of the fuel car.
From the perspective of new energy vehicle safety, for the TSP platform, it is necessary to classify the key data of the system and divide the security level, and control the access rights of different levels of data to ensure that the platform in need can obtain the specified data. From the data results of carbon emissions from new energy vehicles, in 2021, the carbon emissions per unit mileage of pure electric vehicles will be about 70 grams of carbon dioxide emissions per kilometer, and fuel vehicles will be about 176 grams of carbon dioxide emissions per kilometer. It is expected that the carbon emission per unit mileage of pure electric vehicles will drop to 20 grams per kilometer in 2035, which is more than 70% lower than that in 2021.

***Keywords:*** *Electric cars, Security, Environment.*

## 1. INTRODUCTION

### *1.1 Background*

In recent years, a new type of vehicle has appeared on the streets. It looks a little different from traditional cars, and it does not have an engine sound. This new type of vehicle is an electric vehicle. With the development of industry and society, people have more and more demand for vehicles. These huge number of vehicles are used for transportation and daily lives, but traditional fuel cars make a lot of tail gas pollution. This pollution has a great effect on the environment, and people cannot stop using vehicles. To deal with this problem, electric cars are introduced to the market. Electric cars do not have any tail gas pollution. It also has extremely fast acceleration and a quiet driving experience. However, people are often resistant to new products and look down on them. Some crazy fans of fuel vehicles cannot accept to buy or even see electric cars. They also tell other people who are not crazy fans of fuel cars not to buy electric cars. Then they list many disadvantages of electric cars, such as range anxiety. Other people who never bought a car and consider buying a new vehicle, do not know about the difference between electric cars and fuel cars, so they prefer to choose to buy fuel cars. The reason is that they never use electric cars, all the vehicle they have been touched is fuel vehicles. People often choose the product they are familiar with. Most people do not support electric cars because they do not find or admit the advantages of electric cars and they think environmental issues are far away from them.

### *1.2 Related research*

This article examines the efficiency, cost, and greenhouse gas emissions of electric vehicles (EVs), including the impact of EV charging on electricity demand and generation and distribution infrastructure.

Greenhouse gas emissions from electric driving mainly depend on the type of fuel (coal or natural gas) used to generate electricity and charge, ranging between 0 g km-1 (using renewable energy) and 155 g km-1 (using old electricity) coal power plant). According to the projected generation capacity of the Netherlands in 2015, electricity for electric vehicle charging will be mainly generated using natural gas, emitting 35-77 g CO2 eq km-1. [1]In this article, the authors analyze the performance of electric family vehicles. In particular, first, the possibility of introducing electric vehicles in urban transport is assessed and its economic viability is assessed. We identified potential EV demand, which was predicted using declared preference (SP) analysis. The research was conducted at American universities. Palermo uses SP technology to calibrate the logit demand model to model the choice between electric and conventional vehicles. Combustion cars and electric cars. [2] This article presents experience curves and a cost-benefit analysis of electric and plug-in hybrid vehicles sold in Germany. We found that the sales of new energy vehicles have a certain customer group. At current levels, state-of-the-art after-treatment systems can still reduce NOx and particulate emissions at a lower cost than electrifying the powertrain. Overall, the observation of robust technology learning speaks volumes about the need for policymakers to focus on electrification of road transport, particularly addressing the availability of charging infrastructure [5]. With the introduction of electric vehicles in the automotive market, drivers are more concerned about their consumption of EVs (electric vehicles) due to a lack of proper infrastructure. However, only a few studies focusing on ecological behavior and consumption have been conducted. This article is to empirically evaluate the effect of feedback on electric vehicle driving behavior involving self-management performance. That is, the authors hypothesize that feedback is provided to the driver on driving behavior and battery consumption, and also helps the driver manage his autonomy more efficiently.Preliminary results are that electric vehicles are more efficient, cost less than gasoline vehicles, and emit fewer greenhouse gases. It also shows that the driver with the instrument feedback performs better and is safer, possibly due to increased driver control and better driver attention. Therefore, this aspect is also an advantage of electric vehicles.[7]This article analyzes and studies the need for accurate voltage measurement by open-circuit voltage method in battery management systems for lithium-ion batteries to determine the state of charge and balance management. The existing problem is that there are some deficiencies in the voltage measurement. This paper also introduces a vehicle lithium-ion battery system using an optocoupler-controlled switch array. The circuit principle is analyzed in detail and the experimental data is given. Thus, we can draw the advantages of new energy vehicle batteries. [8]Electric vehicles have been identified as a key technology for future emissions and energy consumption. In this article, the aim is to review and evaluate the energy efficiency and environmental impact of new energy vehicles (BEVs). The only technological alternatives available on the market today for internal combustion engine (ICEV) vehicles can be powered by batteries or fuel cells (FCVs) supply. This paper describes the technical structure of BEV, making it clear that it is relatively simple compared to ICEV. The research in this paper demonstrates that electric vehicles can be used as a suitable tool to move towards a more sustainable future. Because of the limited sophistication of EV technology beyond the battery, used cars can also be converted from combustion to EV. In this way, it appears to be possible to reduce CO2-equivalent emissions by 80% (a 5x increase in efficiency) [10].

Global interest in electric and hydrogen vehicles is growing due to rising oil prices. Electric vehicles have these advantages. For example, reducing dependence on oil, reducing carbon dioxide and PM10 emissions, and reducing oil prices. This article compares the cost of driving an electric and hydrogen fuel vehicle. Depreciation costs, fuel costs, fixed costs, and costs associated with repairs, maintenance, and wheels of different models were calculated. In addition to the economic benefits, electric vehicles have other advantages, such as reduced dependence on oil, and reduced environmental costs. Electricity can come from a variety of sources making it less susceptible to large price swings. Because the performance of EVs equipped with advanced lithium-ion polymer batteries is sufficient for most consumers, the main electrical infrastructure is already in place, and EVs require little maintenance to enable mass production of EVs shortly soon. [3]Environmental pollution is a problem that the whole world is paying attention to now. The increase in greenhouse gas emissions has led to the greenhouse effect. Therefore, for people's life and work, choosing new energy vehicles has a lot of environmental benefits. However, the technology of new energy vehicles needs to be vigorously developed to provide long-distance power for vehicles. In this race of evolution and efficiency, new energy vehicles have many advantages and disadvantages. One of them is what happens at the end of the life cycle of the battery and electric motor.

[4]To reduce greenhouse gas emissions, many countries around the world have implemented policies to promote electric vehicles (EVs). But surprisingly, the adoption of electric vehicles in South Korea has been rather slow. This article analyzes consumers' preference for electric vehicle technology and environmental attributes, and analyzes consumers' willingness to pay (WTP) for electric vehicle attributes, such as cruising range, charging method, charging time, self-driving function, carbon dioxide ($CO_2$) ) reduction rate and purchase price. The results show that the current low acceptance of electric vehicles is due to their relatively high price and a lack of battery charging technology that meets consumers' expectations for charging methods and timing. [6]

Through this article, we can learn the following advantages of new energy vehicles, such as, first, no need to refuel: electric vehicles are completely powered by electricity, which means that you no longer need to buy any fuel. With electric vehicles, the cost of fuel can be avoided. Second, clean. Electric vehicles run on electric motors and are particularly environmentally friendly. Driving new energy vehicles can contribute to a healthy and green environment. Third, drive safely: EVs are tested like other fuel-powered vehicles. In the event of an accident, the safety gas can be expected to open and cut power from the battery. It can be very good to avoid serious injury to the occupants of the vehicle. [9]

### *1.3 Objective*

The development of the automobile industry can not only speed up the process of the new era but also comprehensively enhance the important role of automobiles in social and economic development. At this stage, the automobile is an important means of transportation, and it needs to be macro-regulated to produce reasonable economic effects, which will bring about a new industrial base, thereby protecting the ecological environment, improving resource utilization, and ensuring that the automobile industry can be used in the future. Better development. This article conducts an analysis of the advantages of new energy vehicles in terms of energy consumption, battery life, safety, and carbon emissions so that people can better understand new energy vehicles.

## 2. NEW ENERGY VEHICLE ENERGY CONSUMPTION

The energy consumption of new energy vehicles cannot be embodied by the description, but also use data to display its advantages. The following is my analysis. A simple calculation, the average fuel consumption of a tympanic fuel car in 2020 is 100 kilometers per 100 kilometers. The electric vehicle is 12 degrees, which is subject to the electricity bill sold to the owner of the charging pile.

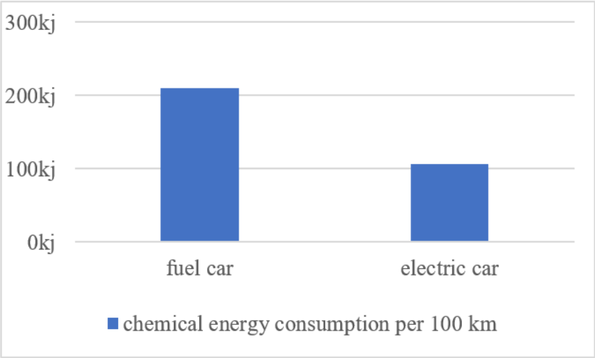


**Figure 1.** Chemical energy consumption per 100 km.

Therefore, from the chemical energy consumption of fuel, even pure thermal power, the chemical energy consumption of electric vehicles is only half of the fuel truck. If considering the energy consumption from oil to gasoline, refining the amount of equivalent fuel consumption per ton of oil is less than 63kg, that is, every 6% of its energy is consumed each energy. According to the National Energy Administration, the national cross-provincial transmission average loss is 3.8% to 4.3%, and the average loss of transmission is 1.2% to 1.5% in the province. That is, from the power plant generator, the average loss between the user's electric meter output is about 4%, and the province is about 1.4%. That is, the electric vehicle is only 1/5 to 2/3 of the electric vehicle in the unit energy transfer of the product gasoline / electric to the car, which has not considered the energy consumption of the refined oil transportation, which is the reference value of each The fuel consumption of the ton gasoline per 100 kilometers is about 10kg, ie 1% of gasoline energy. There is no such loss. Therefore, only the electric vehicle chemical energy consumption of the unit's mileage is compared, even if only the gasoline is only half of the gasoline, and the thermal power only accounts for about 70% of domestic power generation.

As for the manufacturing energy consumption, a car that is 100,000 km requires about 4.8-liter gasoline about 4.8 tons, refining 4.8 tons of oil, and manufacturing a battery that is energy-consuming high-profile powered by this expecting professionals.

## 3. SAFETY

### *3.1 Water safety of new energy vehicles*

Unlike traditional fuel vehicles that need to worry about water wading, which can easily cause mechanical damage to the engine, the power plants of new energy vehicles are all closed. The power battery pack of new energy vehicles is heavier and is generally installed at the bottom of the car body. When the driving road is deep in water, the power battery may be submerged. At this time, its waterproof performance is particularly important. Therefore, in the process of designing the battery pack, ensure that the key components such as the shell, cable, and plug of the battery module meet the waterproof level requirements specified by the national standard. When the dynamic test of the wading test is carried out under the conditions of faster vehicle speed, some high-voltage components complement the static IP67 design of the high-voltage components and the dynamic test of the wading test to ensure safety.

The International Electrotechnical Commission - IEC has set the level of protection against dust, water vapor, etc., which may cause damage to electronic equipment. In the use of some electronic equipment, we can find the English + digital signs of IPXX, such as IP67. The first digit represents the dust protection level (6 levels in total), and the second number is the waterproof level (8 levels in total). Different electronic equipment use environments correspond to different IP protection levels, and the waterproof level of automobiles is also involved. At present, for mass-produced electric vehicles, the complex and changeable use environment requires the battery pack to have a higher IP protection level, so the protection level of most electric vehicles can reach the IP67 level, and the waterproof performance of this level can at least Make sure that the battery pack is submerged in water to a depth of one meter for a certain period of time without any problems. On the other hand, the battery pack of an electric vehicle (passenger car) is located on the chassis of the vehicle, so compared to the vehicle as a whole, the standing water almost completely covers the roof, and the battery pack will not cause problems. In fact, it is not difficult to find that, except for the battery pack, the waterproof level of the powertrain (motor, transmission system, etc.) and cable input and output connectors of electric vehicles is relatively low, and most of them meet the protection level of IPX4 or 6. IPX4-IPX6 means that the electronic equipment can prevent splashes, water jets, etc., and the corresponding usage conditions are similar to driving in moderate rain or using a high-pressure water gun to wash a car. In most cases, electric vehicles are more capable of wading than gasoline vehicles. Because the pure electric vehicle does not have an engine, there is no need to worry that the water level is too high to flood the air intake, which is equivalent to improving the water wading ability of the whole vehicle from the source.

According to the current water wading standards for new energy electric vehicles, the national standard GB/T18384.3 and the international standard ISO6469.3-2001 can be found. It can be found that the water depth required for these water wading tests is almost between 20cm-30cm, and the water depth above 30cm There is no standard test. It is almost only within the depth of more than half of the wheels to ensure the safety when wading, and the actual rainy season is also more suitable. The test speed is generally below 20 kilometers per hour, and you should pay more attention to wading in the rainy season. If you drive faster, the water flow will be bigger and stronger. Objectively speaking, compared with traditional fuel vehicles, electric vehicles do not need to consider the needs of air intake and exhaust (no engine air intake, no risk of wading in the exhaust pipe), and the battery pack has an IP67 waterproof level. The water capacity has certain advantages, but it cannot exceed 30 cm in height. In addition, it should be noted that the complex components in rainwater may also cause certain corrosiveness to metal parts such as motors, battery casings, and vehicle bodies. After wading in water, wash the car as soon as possible.

### *3.2 Information Security of New Energy Vehicles*

With the rapid development of information technologies such as 5G, artificial intelligence, and the Internet of Things, automobiles will gradually develop into the next mobile smart terminal. The research of new energy vehicles conducts a comprehensive and in-depth analysis of vehicle information security issues and builds a system protection mechanism, which has become one of the core technologies for the development of intelligent networked vehicles. The car networking system is generally composed of three parts: vehicle terminal, network communication, and TSP (Telematics Service Provider) platform. The vehicle terminal is the hardware foundation, including communication system, electronic control system, and central control system; network communication is the transmission channel to help the vehicle and the TSP platform realize data interconnection; the TSP platform is a public cloud platform that is responsible for the storage and calculation of vehicle data. And it can help passengers realize in-car entertainment, navigation, road rescue, OTA (Over-the-Air Technology) upgrades, and other services.

### *3.3 New energy vehicle battery thermal safety*

New energy vehicle batteries need to have a high capacity, high voltage, and high discharge rate, which means that the battery itself must generate and withstand more heat generated during use. If a lithium-ion battery generates a lot of heat, it is easy to reduce its capacity and life. Certain extreme conditions (such as overheating) may cause thermal runaway accidents such as fires or explosions. At present, the most researched battery thermal management methods include air cooling, liquid cooling, and phase change material cooling. Among them, air cooling and liquid cooling, which are active cooling methods, use some external equipment, such as water pumps, fans, and pipes, to quickly take away the heat generated by the battery. On the other hand, establish an accurate and timely early warning monitoring mechanism to prevent battery thermal runaway. For example, algorithms that can quickly and accurately determine SOC, battery health, and capacity, and algorithms for fault detection such as internal short circuits are embedded in the battery management system to ensure the safety of the battery system.

### *3.4 Electromagnetic radiation safety of new energy vehicles*

The influence of electromagnetic radiation on human safety has gradually attracted widespread attention at home and abroad. Different from traditional fuel vehicles, new energy vehicles rely on electrical energy as power, and electrical energy is transmitted to key components through power lines inside the vehicle. Each key component is a high-power electrical component, which will create an electromagnetic environment around the component during the operation of the car. The electric field intensity in a new energy vehicle decreases as the height increases, and the higher the height, the faster the decrease. Therefore, in the actual production process, the shielding of the drive cable is increased, for example, by increasing the distance between the cable and the vehicle floor (appropriately reducing the level), effectively reducing the electromagnetic radiation in the car space, ensuring the health and safety of the people in the car.

### *3.5 New energy vehicle mechanical safety*

In the event of a mechanical safety failure, a fast and accurate power-off signal can be issued to enable the internal electrical system of the new energy vehicle to complete the power-off in time, avoiding electrical system short-circuits and fires caused by too late power-off, and protecting the system. normal operation. Whether it is necessary to cut off the power when a mechanical safety failure occurs, needs to be defined in conjunction with the damage of the battery system and the electrical system and the safety threshold during the actual failure of the vehicle.

## 4. THE NEW ENERGY AUTOMOBILE INDUSTRY UNDER THE GOAL OF CARBON PEAK AND CARBON NEUTRALITY

### *4.1The new requirements of carbon peaking and carbon neutrality goals*

As the greenhouse effect threatens the survival of mankind, energy conservation and emission reduction and the realization of "zero-emission" have become the unanimous demands of the international community. To this end, the United Nations has successively issued three landmark international legal documents of the "Framework Convention on Climate Change", "Kyoto Protocol" and "Paris Agreement", calling on all countries to work hard to achieve "zero emissions" of global carbon dioxide from 2021 to 2050. The goal is to control the global average temperature rise to 2 degrees Celsius, the pre-industrial level, and limit the temperature rise to 1.5 degrees Celsius. To implement this goal, countries around the world have accelerated the pace of emission reduction and carbon control. China has proposed the goal of achieving a carbon peak by 2030 and achieving carbon neutrality by 2060. The United States has launched a "Green New Deal" and plans to achieve zero emissions by 2050. The European Union has made the latest commitment to reduce greenhouse gas emissions by at least 55.0% by 2030 compared to the 1990s and strives to achieve carbon neutrality by 2050. Japan, South Korea, Canada, and other countries have all proposed carbon-neutral emission reduction targets by 2050.

The main source of carbon emissions is the burning of fossil fuels, and the transportation sector is one of the main sources. To reduce dependence on fossil fuels, governments and related companies are working hard to decarbonize the transportation sector. Emission reduction strategies mainly focus on avoiding unnecessary travel, shifting travel to more sustainable passenger and freight transportation, improving transportation efficiency, promoting market penetration of new energy vehicles, and adopting renewable energy. Among them, the rapid deployment of new energy vehicles can not only achieve large-scale emission reductions, but also reduce dependence on fossil fuels, coupled with the public’s awareness of environmental externalities and the rapid emergence of new technologies, with new energy vehicles as the core The concept of an environmentally sustainable transportation system has been widely recognized, and all of the above have prompted traditional automobile manufacturers to increase their research and development efforts on new energy vehicles. The BMW Group announced that by 2030, the average carbon dioxide emissions for the entire life cycle of a bicycle will be reduced by at least 1/3 compared to 2019, and the scope of carbon emissions reduction will be extended to the entire industry chain. Volvo Cars plan to reduce carbon emissions from manufacturing to logistics operations by 25.0% by 2025. Between 2018 and 2025, it will reduce carbon emissions during the entire life cycle of each vehicle by 40.0%, which will be related to the global supply chain. Reduced carbon dioxide emissions by 25.0%. Nissan Motor proposes that by 2050, the entire group's corporate operations and product life cycles will be carbon neutral, and it plans to achieve 100% electrification of new models in core markets by 2030. Volkswagen, Mercedes-Benz, and other auto companies have also announced carbon neutrality targets and low-carbon strategies. Among Chinese auto companies, BYD proposes to build a green procurement system of "green suppliers, green raw materials", research and explore the carbon footprint of core components such as new energy vehicles and power batteries and strive to become a benchmark enterprise in the field of new energy vehicles for carbon emission reduction. BAIC Group proposes to build a green factory, establish a green management system for the entire product life cycle, improve energy efficiency, and promote the green and low-carbon transformation of the automotive industry.

### *4.2The goal of carbon peak and carbon neutrality*

As an important development direction of the current automobile industry, new energy vehicles have become a strategic location for major automobile manufacturers to compete. Compared with the development of new energy automobile industry in European and American countries as an effective way to achieve energy-saving and emission reduction, China regards it as an important part of strategic emerging industries and strives to realize China's automobile industry through the "curve overtaking" of new energy vehicles. High-quality development.

Driven by policies, China's new energy vehicles have not only made rapid progress but also have shown a trend toward intelligent development. According to statistics, China's new energy vehicle production and sales reached 1.242 million and 1.206 million in 2019. In 2020, despite the impact of the epidemic, the production and sales of new energy vehicles will still achieve a year-on-year growth of 7.5% and 10.9%, reaching 1.366 million and 1.367 million respectively. In the first quarter of 2021, as the market resumes, the production and sales of new energy vehicles are booming, with 533,000 and 515,000 vehicles respectively completed, an increase of 3.2 times and 2.8 times respectively year-on-year, creating the highest sales level in the same period in the first quarter. The penetration rate of new energy vehicles has also been rising, approaching 8.7% in May 2021, reaching the highest level in history. At the same time, in 2020, the national new car intelligent configuration rate will reach 86.0%, the intelligent driving equipment rate will reach 68.0%, and the OTA equipment rate will be 43.0%. The automobile industry as a whole is gradually increasing the importance of intelligent configuration. Among them, new energy vehicles are important participants and promoters. Domestic Internet companies, such as Huawei, Baidu, and Ali, have entered the field of new energy vehicle on-board systems to provide intelligent software services and support for vehicles to meet the new needs of consumers for safety, comfort, and interconnection in the process of using cars.

From a global perspective, after a decade of rapid growth, new energy vehicles will exceed the 10 million mark in 2020, an increase of 43.0% from 2019, accounting for 1.0% of the total number of vehicles, of which pure electric vehicles account for the increase 2/3 of the number of electric vehicle registrations. In the first half of 2020, affected by the epidemic, the number of new car registrations fell by about 1/3 year-on-year, but this part of the decline was offset by strong demand in the second half of the year, resulting in a decline of only 16.0% year-on-year. Electric vehicle sales rose by 70.0%, reaching 4.6% of new car sales. In 2020, there will be about 3 million new electric vehicle registrations worldwide, and the number of new electric vehicle registrations in Europe has doubled to 1.4 million, surpassing China for the first time and becoming the region with the largest annual growth. In other countries, such as the U.S. auto market, the decline in the number of electric vehicle registrations in 2020 was slightly smaller than that of the entire market. Since Japan's electric vehicle registrations peaked in 2017, the absolute and relative values of the electric vehicle market have been declining. In 2020, the number of electric vehicle registrations in Japan will drop by 25.0%.

Corresponding to the changes in the production and sales of new energy vehicles, consumers will spend 120 billion U.S. dollars in purchasing new energy electric vehicles in 2020, an increase of nearly half compared with 2019, driving sales growth by 41.0%. This is inseparable from government subsidies and incentives for the consumption of new energy vehicles. In 2020, governments around the world spent approximately US$14 billion on subsidies and tax reductions for the purchase of new energy vehicles. As China continues to "retreat" government subsidies for new energy vehicles, European countries have increased their subsidies for new energy vehicles, so that the sales growth of new energy vehicles in European countries in 2020 exceeds that of China.

The above data shows that although the new crown epidemic has interrupted the strong growth of new energy vehicles for ten years, under the dual effects of emission reduction pressure and policy incentives, both the production and sales of new energy vehicles and the market share are increasing. Global new energy vehicles The industry is still in a stage of rapid development.

As mentioned above, the international legal documents of the United Nations call on countries from 2021 to 2050 to strive to achieve the goal of "zero emissions" of global carbon dioxide. If the automobile industry wants to achieve this goal, it is far from enough to rely solely on the development of the traditional automobile industry. It must start from the energy side. This is the necessity of developing new energy vehicles, and it is also the advantage of new energy vehicles that should not be underestimated. We believe that under the goal of carbon uptake and carbon neutrality, new energy vehicles can achieve faster and better development.

## 5. CONCLUSION

This article analyzes the advantages of new energy vehicles from the perspective of energy consumption, battery life, safety, carbon emissions, and environmental protection of new energy vehicles, and strives to reduce or even eliminate people's prejudice against new energy vehicles. In general, the emergence of new energy vehicles has further promoted the development of the social economy and played a very important role in accelerating the transformation of the automobile industry. While new energy vehicles bring convenience to people's travel, energy consumption and atmospheric environmental pollution are greatly reduced, which is an important breakthrough for accelerating the birth of the new energy technology revolution and promoting the transformation of the automobile industry.

## REFERENCES

[1] Van Vliet O, Brouwer A S, Kuramochi T, et al. Energy use, cost and CO2 emissions of electric cars[J]. Journal of power sources, 2011, 196(4): 2298-2310. Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S037877531001726X

[2] Zito P, Salerno S. Potential demand and cost-benefit analysis of electric cars[J]. 2004. Retrieved from: https://www.openstarts.units.it/bitstream/10077/5842/1/Zito_Salerno_ET27.pdf

[3] Van Den Bulk J, Hein L G. A cost-and benefit analysis of combustion cars, electric cars and hydrogen cars in the Netherlands[J]. Wageningen University, the Netherlands, 2009. Retrieved from: http://www.olino.org/blog/nl/wpcontent/uploads/2009/01/a_cost__benefit_analysis_of_combustion_cars_electric_cars_and_hydrogen_cars_in_the_netherlandsfinal.pdf

[4] Racz A A, Muntean I, Stan S D. A look into electric/hybrid cars from an ecological perspective[J]. Procedia Technology, 2015, 19: 438-443. Retrieved from: https://www.sciencedirect.com/science/article/pii/S2212017315000638

[5] Weiss M, Zerfass A, Helmers E. Fully electric and plug-in hybrid cars-An analysis of learning rates, user costs, and costs for mitigating CO2 and air pollutant emissions[J]. Journal of cleaner production, 2019, 212: 1478-1489. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0959652618337211

[6] Mildenberger U, Khare A. Planning for an environment-friendly car[J]. Technovation, 2000, 20(4): 205-214. Retrieved from: https://www.sciencedirect.com/science/article/abs/pii/S016649729900111X

[7] Beloufa S, Vailleau B, Boucheix J M, et al. Eco-driving with electric cars: effect of continuous and on-demand feedback on driving behavior and safety[J]. 2014. Retrieved from: https://sam.ensam.eu/handle/10985/10002

[8] ZHENG X, DAI S, CUI X. Design of the Voltage Detecting System for Electric Cars Lithium-ion Batteries[J]. Electrical Measurement & Instrumentation, 2012, 4. Retrieved from: https://en.cnki.com.cn/Article_en/CJFDTotal-DCYQ201204023.htm

[9] Targonya A, Khmeluk A, Bankovskaya I. Electric cars: advantages and disadvantages[J]. 2019. Retrieved from: https://rep.bntu.by/bitstream/handle/data/60789/56-59.pdf

[10] Helmers E, Marx P. Electric cars: technical characteristics and environmental impacts[J]. Environmental Sciences Europe, 2012, 24(1): 1-15. Retrieved from: https://enveurope.springeropen.com/articles/10.1186/2190-4715-24-14