

REDUCTION OF GREENHOUSE GAS EMISSIONS IN ROAD TRANSPORT TOWARDS THE "EV AGE"

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ABSTRACT

Since the Fourth Industrial Revolution, the production, consumption, and energy utilization of humans have been excessively dependent on fossil fuels. The development and utilization of fossil energy result in the generation of a substantial quantity of greenhouse gases, which leads to significant ecological damage. In various industries, road transport has become a major contributor to global greenhouse gas emissions due to its excessive use of fossil fuels. Given the escalating global climate degradation and growing concerns over energy security, nations have prioritized low-carbon transportation as a pivotal strategy to address climate deterioration and achieve sustainable development. As the key to the development of low-carbon transportation, new energy vehicles have the advantages of low emissions, high efficiency and low noise, which can effectively reduce greenhouse gas emissions and improved air quality. This essay discusses the status, existing problems and shortcomings of traditional fuel vehicles under the new global sustainable development strategy, and explains the advantages and disadvantages of new energy vehicles, especially electrical vehicles (EV) under the current situation by comparative methods. Finally, combined with the current development status of new energy vehicles in China and foreign countries, the future development trend of new energy vehicles and traditional fuel vehicles is analyzed. Based on the theme of the conference, this essay draws a reasonable conclusion that new energy vehicles can significantly impact the upskilling and reskilling of the transportation industry in the coming period, and can improve transportation efficiency, ensure transportation quality, solve the current greenhouse gas emissions problem.

1. INTRODUCTION

Nowadays, with greenhouse gas emissions and global warming, energy security issues are serious. The road transport industry development has never stagnated, which will undoubtedly exacerbate the deterioration of the environment. However, in the past few years, the emergence of new energy vehicles has gradually shaken the status of traditional fuel vehicles, some new energy vehicles like EV have gradually appeared in the city, and people's awareness of new energy vehicles is gradually improving, its low-carbon and efficient advantages are also constantly accepted by residents. This essay discusses the status, existing problems and shortcomings of traditional fuel vehicles under the new global sustainable development strategy, and explains the advantages and disadvantages of new energy vehicles, especially electrical vehicles (EV) under the current situation by comparative methods.

2. COMPARISONS

Compared with traditional fuel vehicles, EV have both advantages and disadvantages.

Specific performance shows in the following aspects.

2.1 Traditional Fuel Vehicles

Traditional fuel vehicles offer greater convenience for refueling compared to EV. Gasoline and diesel stations are readily available in both urban and rural areas, allowing for refueling at any time and place. In contrast, the availability of charging stations for EV is relatively limited. Additionally, traditional fuel vehicles have a longer travel range and do not require frequent replenishment, making them more suitable for long-distance journeys. Furthermore, the refueling process at gas stations is faster, taking only a few minutes to complete compared to the longer charging time required for EV. Moreover, traditional fuel vehicles demonstrate greater reliability in extreme temperatures.

As stated in this essay, the primary drawback of conventional fuel vehicles lies in their reliance on fossil energy, resulting in the emission of greenhouse gases and making exhaust emissions as a significant contributor to air pollution. Furthermore, global oil prices are subject to substantial fluctuations, rendering fossil energy unstable and costly both in terms of fuel expenses and long-term usage. Additionally, the noise produced by traditional fuel vehicle engines also poses an environmental impact.

2.2 Electrical Vehicles

Electrical vehicles, in contrast to traditional fuel vehicles, utilize batteries as their primary source of energy, resulting in zero exhaust emissions and minimal environmental pollution. By harnessing electric energy as a power source, EV effectively reduce reliance on fossil fuels and promote sustainable development. Furthermore, EV exhibit higher energy efficiency compared to fuel vehicles, enabling them to travel longer distances while consuming the same amount of energy and achieving lower driving costs post-charging. The electric motor of EV also operates with reduced noise levels, contributing to a quieter and the more comfortable driving experience.

However, EV still have several limitations. These include a limited range, requiring the support of charging stations for long-distance travel. And the number and availability of charging stations are significantly lower than the gas stations worldwide, posing a challenge for long-distance EV travel. Additionally, there is a lengthy charging time and high time cost associated with waiting for recharging. In extreme environmental conditions, battery performance may be compromised, leading to a terrible driving experience.

3. THE ANALYSIS OF THE CHINESE AND INTERNATIONAL SITUATIONS

3.1 Chinese Situation

Firstly, in terms of national policies, regulations have been promulgated to clearly support the production and application of new energy vehicles. In May 2022, The People's Government of Beijing Municipality issued a document called "14th Five Year Transport Development Strategy", which explicitly stipulated that all distribution vehicles below 4.5 tons must utilize 100% new energy vehicles (The People's Government of Beijing Municipality, 2022). Concurrently, several provinces have also articulated their aspirations

to achieve low-carbon transportation infrastructure development (Huang, 2023). For example, The People's Government of Hainan Province issued a notice called "Carbon Peak Implementation Plan" which clearly proposed that the entire island need to completely ban the sale of fuel vehicles by 2030. In addition to special purposes, vehicles in the public service in Hainan Province have to fully use clean energy (The People's Government of Hainan Province, 2022).

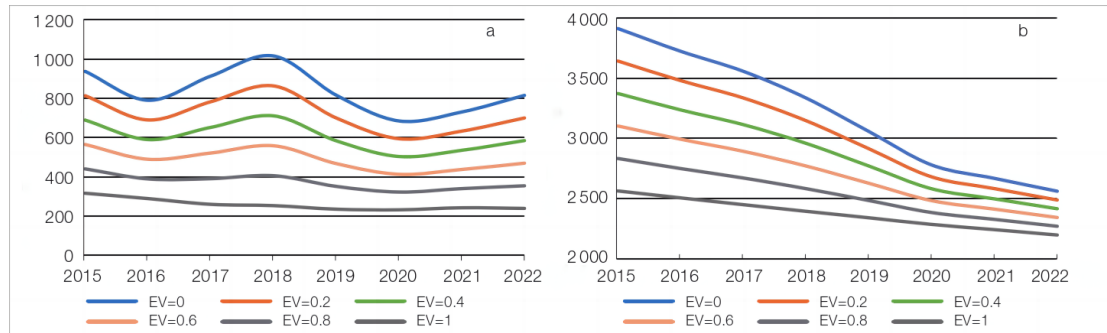


Figure 1: Scenario analysis of road vehicle energy consumption (a) and carbon emissions (b) of every single electric vehicle from 2015 to 2022

When EV=0, it indicates that among the vehicles traveling on the road, the percentage of electric vehicles is 0%, and the percentage of fuel vehicles is 100% (Guo, 2024).

Secondly, in the realm of science and technology, China has advanced comprehensive EV technology. This rapid advancement in EV science and technology is attributed to the encouragement by national policies.

Lastly, from a social perspective, there has been an abundance of recent news coverage on EV. The popular car, such as XiaoMi SU7 has garnered public praises, prompting numerous manufacturers to advocate for EV usage by emphasizing the economic advantage of electricity over oil, thereby stimulating EV sales in China.

3.2 International Situation

In 2019, The European Commission issued The European Green Deal (The European Commission, 2019), which outlined a set of emission reduction measures in transport, energy, and other sectors. This protocol indicated a clear move towards EV utilization within its policy framework (Guan, 2022). However, amidst the burgeoning development of Chinese domestic EV industry, numerous international automotive companies have opted to discontinue EV development. The main reason for this shift is the poor sales performance of EV in international markets, with major car manufacturers consistently experiencing losses within their EV business operations. In recent years, due to rapid advancements in EV technology and sales in China, many individuals are now purchasing imported EV from China at lower costs, resulting in a gradual erosion of competitiveness for international counterparts. Consequently, this trend has prompted several car companies to abandon their pursuits in EV research and production.

4. FUTURE DEVELOPMENT TREND

While fuel vehicles currently remain the predominant mode of transport globally, it is unlikely that EV will rapidly replace them as the mainstream option (Wang, 2022). Nevertheless, in the light of the ongoing environmental degradation, it is inevitable that low-carbon transportation and new energy vehicles will come to dominate the future

automotive market. The transition from fossil fuels to electricity in transportation is anticipated to be protracted, with a prolonged coexistence of oil and electricity. Despite facing various challenges such as charging infrastructure deployment, battery longevity, and recycling processes, EV have undeniably played a significant role in reducing greenhouse gas emissions, safeguarding ecological environments, and promoting resource utilization (Wen, 2022; Wang, 2021; Xiong, 2010).

5. CONCLUSION

In order to safeguard the Earth's environment, mitigate greenhouse gas emissions, and uphold the principles of sustainable development, EV are poised to emerge as the predominant mode of transportation within the road transport industry. Intelligent and electric vehicles will play a huge role in the future of the transportation industry, improving the efficiency of current traffic engineering and driver comfort, significantly reducing environmental pollution, and promoting sustainable development. EV can improve the upskilling and reskilling of transportation engineering, and help the industry to transform into high-tech, intelligent and environmentally friendly.

6. REFERENCES

Guan, G 2022. Inspiration from the experience of green and low-carbon development of foreign transport. *Journal of North Traffic*.

Guo, JF 2024. Electric vehicles help promote China's energy security and "carbon peak, carbon neutrality". *Journal of S&T and Society*.

Huang, JS. 2023. Research on carbon emission reduction strategy of Chinese transportation industry under carbon neutral strategy. *Journal of Beijing Jiaotong University (Social Sciences)*.

Sun, LW. 2012. Research on the development status and countermeasures of new energy vehicles in China. *Journal of Chinese Science and Technology Information*.

The European Commission. 2019. (Protocol). The European Green Deal.

The People's Government of Beijing Municipality. 2022. 14th Five Year Transport Development Strategy.

The People's Government of Hainan Province. 2022. Carbon Peak Implementation Plan.

Wang, SQ. 2022. Development status and prospects of new energy vehicles in China under the background of low carbon environmental protection. *Journal of Times Automobile*.

Wang, JT. 2021. Research progress and implications of low-carbon transportation. *Journal of Ecological Economy*.

Wen, LY. 2022. Countermeasures for green and low-carbon development of Chinese transport industry. *Journal of Transport Energy Saving and Environmental Protection*.

Xiong, Y. 2010. Developing green transport to promote low-carbon transformation. *Journal of Traffic Construction and Management*.