Literature Review Draft: Power Sources and the Development of the Electric Vehicle Market

1. Introduction

The development of electric vehicles (EVs) has seen significant growth worldwide, and the expansion of this market is closely linked to the energy structures of different countries. The academic community has extensively studied how variations in power sources affect the EV market. This review aims to explore how different energy sources influence the adoption of EVs and the future development trends of the global EV market.

2. The Impact of Different Power Sources on the EV Market

2.1 Carbon Emissions and the Environmental Impact of EVs

Research indicates that the lifecycle carbon emissions of EVs largely depend on the cleanliness of the electricity used. Hawkins et al. (2012), in their lifecycle analysis (LCA), pointed out that in regions where electricity is heavily dependent on fossil fuels, the carbon footprint of EVs is not significantly lower than that of conventional internal combustion engine vehicles【1】. In contrast, in countries with a high share of renewable energy, such as those in Northern Europe, EVs offer considerable environmental benefits【2】.

2.2 National Power Structures and EV Market Impact

Researchers have explored how the energy structures of different countries impact the development of their EV markets. For example, Frieske et al. (2013) analyzed the power sources in Germany, France, and China, finding that countries with a higher share of renewable energy are better positioned to accelerate EV adoption through policy incentives【3】. Conversely, in countries where electricity is mainly sourced from coal and other fossil fuels, the environmental benefits of EVs are less pronounced, resulting in slower market growth【4】.

2.3 Economic and Policy Factors

In addition to energy structure, economic and policy factors are critical in shaping the EV market. Zhang et al. (2020) investigated the policy drivers behind EV market growth in China, the United States, and Europe, concluding that policy incentives (such as subsidies and tax benefits) and infrastructure development (such as charging stations) play a significant role in expanding the EV market【5】. Furthermore, fluctuations in electricity prices directly impact the economic viability of EVs, affecting consumer purchasing decisions【6】.

3. Future Development Trends in the EV Market

3.1 The Future Role of Renewable Energy

With the global advancement of renewable energy technologies, the future of the EV market looks increasingly promising. Faria et al. (2015) noted that the widespread adoption of renewable energy sources, such as wind and solar, will further enhance the environmental benefits of EVs and drive their market penetration【7】. Additionally, the implementation of smart grid technology will enable more efficient integration of EVs into power systems【8】.

3.2 Advances in Battery Technology

Technological advancements in battery development are another critical factor in the growth of the EV market. According to Olivetti et al. (2017), future battery technologies, such as solid-state batteries and sodium-ion batteries, are expected to offer higher energy densities and lower production costs, significantly improving the market competitiveness of EVs【9】.

4. Conclusion

The energy structure of a country plays a crucial role in determining the environmental impact and growth potential of its EV market. Meanwhile, policy and technological advancements are key drivers of market expansion. With the increasing share of renewable energy and progress in battery technologies, the potential of the global EV market will grow significantly in the coming decade. Policy incentives and technological innovation will be vital in realizing this potential.

References

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