

# Research on the Integrated Development of Transportation and Energy under the "Dual Carbon" Goals

Lin Zheng <sup>1, a</sup>, Ran Zhou <sup>1, b</sup>, Xiaojun Li <sup>1, c</sup>, Lequn Zhu <sup>1, d</sup>, Yisheng Wang <sup>1, e</sup>

<sup>1</sup> Tianjin Research Institute for Water Transport Engineering, Ministry of Transport, Tianjin 300456, China.;

<sup>a</sup> zhenglin9648@163.com, <sup>b</sup> chinaphoebe@126.com, <sup>c</sup> lixiaojun709@126.com,

<sup>d</sup> zhulequn@hotmail.com, <sup>e</sup> yishwang@126.com

**Abstract.** Under the strategic guidance of the "dual carbon" goals, the integrated development of the transportation and energy sectors has become a crucial path to achieve energy conservation, emissions reduction, and promote green transformation. Based on an in - depth analysis of the background and necessity of the integrated development of transportation and energy, this paper identifies the challenges it faces in policy mechanisms, technical standards, and cross - industry collaboration. Moreover, it proposes targeted countermeasures and suggestions from aspects such as improving policies and regulations, perfecting technical standards, and promoting cross - industry collaborative cooperation, providing solid support for promoting the in-depth integration and sustainable development of the transportation and energy sectors.

**Keywords:** "Dual Carbon" goals; transportation - energy integration; cross - industry collaboration.

## 1. Introduction

Against the backdrop of the global community's active response to climate change and the vigorous promotion of energy conservation and emission reduction, transportation and energy, as the two key areas of carbon emissions, the integrated development between them has become an inevitable trend. With the acceleration of the urbanization process, the transportation demand continues to grow, and the problems of energy shortage and environmental pollution caused by traditional fuel-based transportation are becoming increasingly prominent. At the same time, the energy sector is undergoing profound changes, and new energy technologies are emerging continuously, creating conditions for the integration of transportation and energy. The integrated development of transportation and energy plays a crucial role in achieving the "dual carbon" goals. On the one hand, it helps to reduce carbon emissions in the transportation sector and improve energy utilization efficiency. On the other hand, it can promote the innovation and upgrading of the energy industry, expand the application scenarios of new energy [1-2]. Meanwhile, it can also drive the development of related industries, create new economic growth points, and promote the sustainable development of the economic society.

## 2. Background and Necessity of the Integrated Development of Transportation and Energy

### 2.1 Policy Guidance and Strategic Needs

As key areas of carbon emissions, transportation and energy, their integrated development is of vital importance for achieving the "dual carbon" goals. The advancement of the strategy of building a transportation power requires the construction of a green and efficient modern comprehensive transportation system, which cannot be achieved without the innovative support from the energy sector. At the same time, with the in-depth development of the energy revolution, there is an emphasis on the adjustment of the energy structure and the improvement of energy utilization efficiency. The transportation sector, as a major consumer of energy, provides a vast space for the application of new energy technologies and models. A series of policies issued by the state, such as subsidies for new energy vehicles and support for the construction of charging piles, have created a

favorable policy environment for the integrated development of transportation and energy, highlighting the strategic significance of the integrated development of transportation and energy under the guidance of policies.

## **2.2 Promotion by Technological Progress and Industrial Transformation**

In recent years, new energy technologies have made remarkable progress. The development and utilization technologies of new energy sources such as solar energy, wind energy, and hydrogen energy have been continuously maturing, and the costs have gradually decreased, making it possible to optimize the energy structure in the transportation sector [3-4]. The breakthrough in energy storage technology has solved the problems of intermittency and instability of new energy, making the storage and application of new energy in the transportation sector more reliable. These technological advancements have driven the transformation of the transportation and energy industries, promoting the continuous integration of the two in terms of technology, products, and the market, forming a new industrial ecosystem and stimulating new economic growth points.

## **2.3 The Demand for a Win-Win Situation of Economic and Environmental Benefits**

From the perspective of economic benefits, the integrated development of transportation and energy can reduce transportation operation costs. The cost of using new energy is relatively low. For example, the charging cost of electric vehicles is significantly lower than the fueling cost of fuel-powered vehicles. At the same time, through the optimized allocation and efficient utilization of energy, the operation efficiency of the transportation system can be improved, energy waste can be reduced, and thus the operation costs of the entire transportation industry can be lowered. The integrated development of transportation and energy helps to promote the application of new energy in the transportation sector, significantly reduce carbon emissions and pollutant emissions, improve air quality, alleviate environmental pollution problems, protect the ecological environment, and achieve a positive interaction between economic development and environmental protection.

# **3. Problems Faced in the Integrated Development of Transportation and Energy**

## **3.1 The Policies and Mechanisms for the Integrated Development of Transportation and Energy Need to Be Improved**

At present, the policy system for the integrated development of transportation and energy is still in the process of continuous construction and improvement, and there is still room for improvement in terms of systematicness and coordination. Policies formulated by different departments based on their respective functions sometimes have insufficiently smooth connections during actual implementation, which affects the efficiency of project promotion to a certain extent. For example, although the subsidy policy has played a positive role in promoting the development of the industry, there is still room for further optimization in its implementation details. Some subsidy standards have not been fully and accurately tailored to the actual needs of industry development, resulting in some enterprises taking advantage of policy loopholes to obtain improper benefits during the subsidy distribution process. In addition, key mechanisms such as energy grid connection and trading also face some problems in actual operation. The unclear rules and unsmooth processes limit the wide application of distributed energy in the transportation sector.

## **3.2 The Technical Standards and Specifications Related to the Integrated Development of Transportation and Energy Need to Be Sound**

The transportation and energy sectors belong to different industries and have each formed a set of technical standards and specification systems over a long period of time. This has led to issues such as inconsistent technical standards and a lack of unified specifications during the process of

transportation - energy integration. This situation results in poor compatibility between different devices, and may cause some technical obstacles during actual use and system integration, thereby increasing potential safety hazards. Take charging piles as an example. Currently, there are differences in the interface standards of electric vehicle charging piles of different brands on the market. This makes it difficult for electric vehicle users to use charging piles universally, causing great inconvenience to users. In the interaction between new energy vehicles and the power grid, due to the imperfect relevant standards, the development of vehicle - to - grid integration has been hindered to a certain extent, and it is difficult to fully realize its potential economic and social benefits.

### **3.3 Cross - Industry Collaboration Faces Certain Challenges**

The transportation and energy industries are subordinate to different management departments. During the long - term development process, they have formed independent management systems and operation models, which makes cross - industry collaboration face many difficulties. In each link of project planning, construction, and operation, due to the lack of an efficient communication and collaboration mechanism, problems such as information asymmetry and inconsistent coordination are likely to occur. For example, when the transportation department is planning roads, it sometimes fails to fully consider the layout requirements of energy facilities, resulting in difficulties in site selection and conflicts with road planning during the later construction of energy facilities. When the energy department is building energy facilities, if it does not communicate fully with the transportation department, it may cause poor connection between energy facilities and transportation facilities, thereby triggering problems such as resource waste and repeated construction. These phenomena have hindered the smooth progress of transportation - energy integration projects to a certain extent.

## **4. Countermeasures and Suggestions for Promoting the In - Depth Integration of Transportation and Energy**

### **4.1 Improve the Policies, Regulations, and Guarantee Mechanisms for the Integrated Development of Transportation and Energy**

The government should take the lead in organizing multiple departments such as transportation, energy, and finance to jointly formulate an overall plan for the integrated development of transportation and energy, clarifying the development goals and tasks at each stage. Establish a cross - departmental policy coordination team, hold regular meetings, and strengthen communication and exchanges during the policy - making process to ensure that the policies of various departments are interconnected and work together, avoiding policy conflicts and gaps. Conduct in - depth research on the actual needs of industry development and formulate a dynamically adjusted subsidy standard. Focus subsidies on areas such as technological innovation, application demonstration, and infrastructure construction to improve the accuracy and utilization efficiency of subsidy funds. At the same time, strengthen the supervision of subsidy funds, establish a strict review and supervision mechanism, and use technologies such as big data and blockchain to ensure the fairness and transparency of subsidy distribution.

### **4.2 Improve the Technical Standard and Specification System for the Integrated Development of Transportation and Energy**

Establish a joint technical standard - setting team composed of representatives from transportation, energy, scientific research institutions, and enterprises. Draw on advanced international experience and combine it with China's national conditions to formulate unified technical standards covering the entire industrial chain of transportation - energy integration [5]. Focus on standardizing key technical indicators such as equipment interfaces, communication

protocols, safety protection, and energy efficiency indicators to ensure the compatibility and interoperability of different devices and systems. Strengthen the publicity and promotion of unified technical standards by holding technical standard training seminars and publishing standard interpretation manuals, and improve the awareness and implementation consciousness of enterprises and practitioners in the industry. Establish a technical standard implementation supervision mechanism, regularly inspect products and projects on the market, and impose legal penalties on enterprises that do not meet the standard requirements to ensure the effective implementation of the standards.

### 4.3 Promote Cross - Industry Collaboration and Cooperative Innovation

Establish a cross - industry coordination leading group for the integrated development of transportation and energy, composed of leaders from departments such as transportation, energy, and industry and information technology, to coordinate and solve major cross - industry issues. Establish a regular communication and coordination meeting system to regularly study and solve difficulties and problems in the process of project promotion. Encourage transportation enterprises and energy enterprises to carry out in - depth cooperation through equity cooperation, strategic alliances, and other means. Jointly invest in the construction of transportation - energy integration projects, share resources and technical advantages, and achieve mutual benefit and win - win results. Strengthen the cooperation between universities, scientific research institutions, and enterprises, and establish a collaborative innovation platform for industry - university - research - application. Universities and scientific research institutions give full play to their scientific research advantages to carry out research on key technologies and basic theories, while enterprises transform scientific research achievements into actual products and services according to market demands.

## 5. Conclusion

The integrated development of transportation and energy is an important way to achieve the "dual carbon" goals. However, it still faces many challenges at present and requires the joint efforts of the government, enterprises, and society. In the future, with the continuous progress of technology and the continuous improvement of policies, the integrated development of transportation and energy will have broader prospects. The application of new energy in the transportation sector will become more widespread, infrastructure construction will be continuously improved, and cross - industry collaboration will be closer. We should further seize the opportunities and actively promote the integrated development of transportation and energy to contribute to achieving a green, efficient, and sustainable future.

## References

- [1] YAN Su, Wang Junqiang, Xu Yadong, et al. Current status and prospects of integrated development of transportation and energy [J]. Journal of Changsha University of Science & Technology (Natural Science), 2024, 21(04): 1 - 27. DOI:10.19951/j.cnki.1672 - 9331.20240808002.
- [2] Gu Ming, Xu Da, Fu Qiaolin, et al. Research on carbon peak and carbon neutrality paths of transportation industry under the background of transportation power [J]. Journal of Waterway and Harbor, 2024, 45(04): 662 - 668.
- [3] Zhong Wenjun, Lei Zhenming, Fu Ziwen, et al. Current development status and outlook of offshore green hydrogen energy engineering technology in China [J]. Journal of Waterway and Harbor, 2023, 44(01): 124 - 130.
- [4] Li Shina. Research progress in the application of solar cells on ships [J]. Journal of Waterway and Harbor, 2024, 45(04): 578 - 584.

- [5] Li Ruijie. Development Technology and Prospect for Green and Low - carbon Resilient Road Transport - energy Integration [J].Transport Energy Conservation & Environmental Protection, 2024, 20(05): 1 - 7.