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Exploring the Path of Improving the Energy Regulatory System to Support the High Quality Development of the New Energy Industry

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Abstract: Achieving the "dual carbon" goal requires the rapid growth of the new energy industry and the proper handling of the relationship between environmental protection and economic growth. To ensure the healthy development of this industry, it is necessary to fully leverage the regulatory role of the government. With the acceleration of energy transformation, China's energy industry is ushering in a historic opportunity to transition from the low-end to the high-end value chain. This article delves into the current status of China's new energy industry and its legal regulatory system, pointing out that despite the rapid development of the new energy sector, it still faces many challenges such as chaotic market order, insufficient technological innovation capabilities, and difficulties in energy consumption. The promulgation of the Energy Law marks significant progress in China's rule of law construction in the energy field, but further improving the regulatory mechanism is an urgent task. Based on the analysis of the current regulatory situation, this article summarizes the main problems and proposes several improvement suggestions, aiming to establish a more scientific and efficient legal regulatory framework, promote the virtuous cycle of the new energy industry, enhance China's competitiveness in the global green and low-carbon economy, and ultimately achieve the goal of harmonious coexistence among the economy, environment, and energy.

1. Research significance

As a key path for the future development of the energy sector, the new energy industry integrates a series of clean energy forms including solar energy, wind energy, hydropower, and nuclear energy, playing a crucial role in addressing global energy shortages and environmental protection issues. In recent years, China has made significant progress in this field, but with the rapid growth of the industry scale, some challenges have gradually emerged, such as market disorder, insufficient innovation driving force, and energy consumption difficulties. Improving the regulatory framework of the Energy Law plays an extremely important role in overcoming these obstacles and promoting the development of the new energy industry towards a more mature and efficient direction.

1.1 The significance of the promulgation of the Energy Law

On November 8, 2024, the 12th meeting of the Standing Committee of the 14th National People's

Congress officially passed the Energy Law of the People's Republic of China and announced that the law will come into effect on January 1, 2025. As the first fundamental and guiding law in China to comprehensively cover the energy sector, the formulation of the Energy Law has gone through nearly 20 years, during which it has undergone multiple reviews and revisions, and finally been promulgated and implemented. The promulgation of this law marks significant progress in the legal construction of energy governance in China. It not only fills the gap of the lack of a comprehensive 'mother law' in the energy field for a long time, but also systematically reflects the overall policy, basic principles, and institutional framework of the country's energy work, providing a clear legal basis for promoting the high-quality development of the energy industry. The implementation of the Energy Law plays an extremely important role in promoting the development of the energy industry to a higher level, ensuring national energy security, supporting the transformation of the economy and society towards green and low-carbon direction, and achieving sustainable development goals. It will provide solid legal support for building a clean, low-carbon, and efficient new era energy system, and further strengthen the emphasis on the development of renewable energy, stimulate energy technology innovation, and help optimize China's energy structure and improve energy utilization efficiency.

1.2 The significance of improving the energy regulatory system

A sound regulatory system is an important cornerstone for the effective implementation of energy laws. Firstly, the Energy Law establishes an efficient, unified, and orderly energy regulatory framework by clarifying the regulatory responsibilities of all parties, highlighting key regulatory areas, and innovating regulatory methods. This framework not only ensures the effective implementation of energy related laws and regulations, but also plays a crucial role in maintaining a fair competition environment in the market, ensuring stable energy supply, and promoting the transformation of energy towards green and low-carbon direction. Secondly, a sound regulatory system helps to enhance the overall efficiency of energy management. According to the Energy Law, the energy regulatory department of the State Council is responsible for energy supervision nationwide, and requires relevant departments to jointly assume supervisory responsibilities for energy development, utilization, and market operations within their functional scope. This hierarchical responsibility and clear rights and responsibilities management model is conducive to consolidating the responsibilities of all parties involved, ensuring the quality of energy services and supply security, and strengthening the supervision of natural monopoly enterprises in executing national strategic planning tasks, fulfilling national security and social responsibilities, and participating in market competition. In summary, establishing a sound and effective regulatory system is crucial for implementing the Energy Law. It is not only the foundation for the smooth implementation of the law, but also the key support for improving the modernization level of energy governance and promoting the high-quality development of the energy industry. By strengthening regulatory measures, we can better serve the country's long-term goals in the energy sector, ensure national energy security, optimize energy structure, and improve energy efficiency.

1.3 To improve the regulatory system and promote the development of the new energy industry

The improvement of the energy regulatory system has multiple important implications for promoting the high-quality development of the new energy industry. Firstly, it helps to regulate market behavior and lay a solid foundation for industry development. By establishing clear regulatory standards, it is possible to set thresholds and operational guidelines for new energy enterprises to enter the market, thereby preventing the occurrence of unfair competition and speculative behavior. In this way, market competition will be more fair and orderly, the rights and interests of legitimate enterprises will be protected, and more high-quality capital can be attracted to invest in this field,

thereby promoting the large-scale and healthy development of the new energy industry, enhancing its stability and ability to resist risks. Secondly, a sound regulatory framework can effectively stimulate technological innovation and enhance the core competitiveness of the industry. For example, by providing policy support to encourage enterprises to increase research and development investment, and promoting scientific research cooperation and talent cultivation. This is conducive to achieving key breakthroughs in fields such as efficient energy storage technology and smart grid integration, accelerating the speed of technological upgrading, and enabling China's new energy industry to take a leading position globally. With innovation as the driving force, it promotes high-quality development and expands international market share. Finally, a sound regulatory system is also conducive to ensuring energy security and sustainable development. Reasonable planning can optimize the layout of new energy development, adjust the energy consumption structure, and reduce dependence on traditional fossil fuels. A sound regulatory system can also ensure the effective grid integration and consumption of renewable energy electricity, alleviate supply-demand imbalances, and reduce carbon emissions. In the long run, this move not only conforms to the global trend of addressing climate change, but also promotes the transformation of China's energy strategy, providing clean and stable energy support for the sustainable development of the economy and society, and helping to create a green, low-carbon and beautiful future.

2. The current situation and challenges of the development of the new energy industry

2.1 Current Development Status of New Energy Industry

In recent years, the new energy industry, as a national strategic emerging industry, has achieved significant development under the active guidance of policies. Firstly, China has made significant achievements in the development and application of new energy. As of the end of July 2024, the total installed capacity of wind and solar power reached 1.21 billion kilowatts, surpassing the installed capacity of coal-fired power for the first time. It is expected that by the end of 2024, the cumulative installed capacity of China's new energy industry will increase to 1.9 billion kilowatts, with solar power accounting for over 40%. [1]The total installed capacity of renewable energy generation accounts for 51.9% of the total installed capacity in China, and nearly 40% of the global total installed capacity of renewable energy generation. Secondly, China has also made significant progress in the field of new energy vehicles. The production and sales of new energy vehicles have shown a significant growth trend, with domestic new energy brands performing particularly well. The annual production and sales volume in 2023 were 9.587 million and 9.495 million respectively; In the first ten months of 2024, the production and sales volume reached 9.779 million and 9.75 million respectively, and broke through the annual production of 10 million vehicles on November 14th. The export volume has also grown rapidly, with a cumulative export of 818000 vehicles in the first eight months of 2024, and the market share continues to expand. At present, China has become the world's largest market for new energy vehicles, with world leading manufacturing capabilities and a complete industrial chain. Furthermore, there have been remarkable achievements in technological innovation. China has made a series of important breakthroughs in key technologies of new energy, such as high-efficiency silicon-based photovoltaic cells, large-scale wind turbine blades, and solid-state batteries, which have reached the international leading level. In addition, the government's emphasis on the development of the new energy industry has been continuously increasing, and a series of support measures have been introduced. Governments at all levels vigorously promote the development of the new energy industry by providing subsidies, tax reductions, and formulating industrial development plans. Finally, with the continuous improvement of technological level and increased policy support, the scale of China's new energy industry continues to expand, and the industrial chain is becoming increasingly mature. The number of new energy enterprises is constantly

increasing, and the industry concentration is gradually increasing. Especially in the fields of photovoltaic and wind power generation, a group of enterprises with strong international competitiveness have emerged. At the same time, the new energy industry chain covers multiple links from raw material supply to equipment manufacturing, project implementation to operation and maintenance, forming a relatively complete system.

2.2 The challenges faced by China's new energy industry

China's new energy industry has achieved leapfrog development, but still faces many challenges. Although significant progress has been made in the field of technology, there are still some key technologies that urgently need to be overcome. Taking the solar photovoltaic industry as an example, there is still a gap between China and the international leading level in high-end photovoltaic equipment manufacturing and efficient solar cell production; In the new energy vehicle industry, key performance indicators such as battery energy density, driving range, and charging efficiency still need to be further optimized to better meet the growing demand for high-performance electric vehicles in the market. With the continuous expansion of the new energy market, more companies are entering this field, intensifying market competition. On the one hand, the competition among domestic peers around technological innovation, cost control, and market share competition has become increasingly fierce, leading to a decrease in product prices and compressing the profit margins of enterprises; On the other hand, in the international market, China's new energy enterprises face competition challenges from developed countries, including trade barriers and technological blockades against Chinese new energy products in Europe, America, and other regions, which increase the difficulty of exporting Chinese new energy products. In addition, there are also certain issues at the policy level, such as insufficient policy stability and cross departmental collaboration. The development of the new energy industry is highly dependent on government support policies. However, the uncertainty in policy formulation and implementation poses risks to enterprises, such as adjustments to subsidy standards or changes to renewable energy quota systems that may have a significant impact on business decisions. Meanwhile, due to the fact that the new energy industry spans across multiple government departments, the overall policy effectiveness is often poor in practical operation due to differences in target setting, tool selection, and implementation efforts among different departments.

3. Review of the Current Situation and Problems of China's Energy Regulatory System

3.1 The legislative status of energy regulation in China

The direction of the energy market is deeply influenced by national strategic planning and almost entirely depends on policy guidance. In the process of pursuing the "dual carbon" goal, China has strengthened the management of the energy industry through legal frameworks and administrative regulations, actively promoted the transformation of the energy structure towards a cleaner and more efficient mode, and vigorously supported the research and application of new energy technologies, thereby promoting the transformation of the entire society towards a green and low-carbon future.

The regulatory content of China's Energy Law mainly consists of Chapter 7 and Chapter 8, namely Articles 63 to 74, totaling twelve articles. Chapter 7 of the Energy Law specifies that the energy regulatory department and other relevant departments of the people's governments at or above the county level are the supervisory and management departments in the field of energy; Established the supervisory and inspection responsibilities and related measures of the energy regulatory department; Establish an energy regulatory information system; Establish a credit record system and other related content. Chapter 8 of the Energy Law stipulates the legal responsibilities for violating the Energy Law,

including the responsible party, the scope and form of punishment, etc. According to Chapter 8, the responsible party may also bear civil liability, administrative liability, or even criminal liability depending on the different illegal circumstances. The establishment of legal responsibility in Chapter 8 provides strong deterrence for the implementation of the Energy Law and ensures its effective implementation. In addition, Article 12 of Chapter 1 General Provisions of the Energy Law stipulates the regulatory subject, and other chapters also have some provisions related to regulatory content, such as Articles 16 and 17, which stipulate the connection between the energy planning department and the planning department. In addition to the provisions stipulated in the newly issued Energy Law, which has a leading position, there are also multiple single line laws and regulations that still apply, such as the Electricity Law, Coal Law, Renewable Energy Law, Energy Conservation Law, Mineral Resources Law, as well as administrative regulations such as the Regulations on Emergency Response and Investigation of Power Safety Accidents, Electricity Supervision Regulations, Regulations on Emergency Management of Nuclear Accidents in Nuclear Power Plants, and Regulations on Safety Supervision and Management of Civil Nuclear Facilities. In addition, relevant departments such as the National Energy Administration have issued departmental regulations related to energy regulation and law enforcement, such as the "Provisions on the Causes of Administrative Penalty Cases of the National Energy Administration", the "Standards for Administrative Penalty Discretionary Power of the National Energy Administration", and the "Provisions on Administrative Penalty Procedures of the National Energy Administration"[2].

Regarding regulatory policies in the field of energy management, China has successively released a series of documents to regulate related activities. For example, the "14th Five Year Plan for Modern Energy System" was jointly released by the National Development and Reform Commission and the National Energy Administration on January 29, 2022. The document clarifies the core goals of building a modern energy system during the 14th Five Year Plan period, such as enhancing energy security, promoting green and low-carbon transformation of energy, and improving the modernization level of the energy industry chain, aiming to form a clean, low-carbon, safe and efficient modern energy system. [3]Subsequently, on January 9, 2024, the National Energy Administration released the "Key Points for Energy Regulatory Work in 2024", which established the overall policy for energy regulatory work during the year, focusing on two core goals of ensuring energy security and promoting green and low-carbon transformation, and proposed "four regulatory" methods including innovative implementation process supervision, digital supervision, penetrating supervision, and cross departmental collaborative supervision. Its key tasks include strengthening the supervision of energy supply security, regulating the development of clean energy, regulating natural monopoly links, constructing a unified national electricity market system, and enhancing energy safety production. On March 18 of the same year, the National Energy Administration also released the "Guiding Opinions on Energy Work in 2024", further clarifying the main development goals for 2024, namely to continuously enhance energy supply capacity, optimize energy structure, improve energy efficiency, and enhance energy technology innovation. At the same time, emphasis was placed on steadily promoting the development of hydropower and nuclear power projects, continuously improving the policy framework for green and low-carbon transformation, and deepening the reform of energy usage patterns. Finally, on May 23, 2024, the State Council released the "Action Plan for Energy Conservation and Carbon Reduction from 2024 to 2025", which is one of the key measures to achieve carbon peak and carbon neutrality goals, accelerate the construction process of a beautiful China, and comprehensively promote the transformation of the economy and society towards green development.

Overall, China has established a relatively complete policy system in energy regulation. In the process of pursuing the "dual carbon" goal, the implementation of a series of laws, regulations, and policy measures such as the Energy Law not only strengthens the supervision of the energy industry,

promotes the optimization and efficiency improvement of the energy structure, but also provides strong support for the high-quality development of the new energy industry, ensuring that the standardized operation of the energy market and its transformation towards green and low-carbon direction have solid legal basis. In addition, guided by the "dual carbon" target, the country has further ensured energy security through the introduction of multiple legislative and policy documents, accelerated the transformation of the energy system towards a cleaner and low-carbon direction, and improved the technological level and modernization of the entire energy industry chain. These institutional arrangements jointly construct a comprehensive and mutually supportive energy regulatory framework, greatly stimulating the development vitality of the new energy sector, and laying an important foundation for achieving the long-term sustainable development goals of the energy industry and contributing to environmental protection.

3.2 The current practice status of energy regulation in China

Energy regulation plays a crucial role in maintaining energy security, promoting green transformation, advancing market construction, and improving public welfare, and constitutes a key part of the modernization of the national energy governance system. In terms of regulatory agencies and their functions, the National Energy Administration plays a core role by establishing branch offices nationwide and building a relatively complete regulatory system. [4]The bureau is mainly responsible for policy formulation and planning guidance, market supervision and order maintenance, safety management, and emergency response; Its dispatched agencies include 6 regional regulatory bureaus and 12 provincial regulatory offices, whose main responsibilities cover market transaction supervision, safety production and quality management, qualification certification and license management, and other fields. From the perspective of technological application, regulatory authorities are actively adopting big data and intelligent technologies to improve efficiency. For example, in the oil and gas field, an intelligent monitoring system covering major oil and gas pipelines across the country is deployed, which uses sensors to collect key data such as pressure, flow rate, temperature, etc. in real time, and utilizes big data analysis to accurately evaluate pipeline operation status and perform preventive maintenance. For the regulatory practices of market entities and industrial development, taking the new energy vehicle industry as an example, the government has taken measures such as subsidies and tax incentives to stimulate industry development, while also strengthening the access review and product quality control of new energy vehicle manufacturers. This comprehensive regulatory model not only promotes the effective connection between industry support, quality monitoring, and environmental protection, but also promotes the standardized development and upgrading of related energy industries, thereby ensuring the harmonious coexistence between industrial development and public interests.

3.3 Review of Problems in the Field of New Energy Regulation

Although China's energy regulatory system is gradually improving and playing an important role in national energy governance, there are still many shortcomings in the regulation of new energy.

3.3.1 The legal and regulatory system needs to be improved

Although China has promulgated multiple laws and regulations such as the Energy Law and Renewable Energy Law, the legal framework in the field of new energy is still insufficient. Especially for emerging fields such as hydrogen energy and ocean energy, relevant regulations are either too brief or completely missing, making it difficult to achieve comprehensive coverage in the development, utilization, and storage of these new energy technologies. In addition, the current legal

system lacks clear guidance on the specific process of new energy projects from approval to supervision and even subsidies, which not only increases the uncertainty in the execution process of enterprises, but may also lead to the problem of low-quality duplicate construction and illegal projects in some regions. [5]For example, the approval procedures for new energy projects may vary greatly between different regions, lacking unified operational standards. With the rapid development of the new energy industry and the acceleration of technological innovation, existing laws and regulations have not been updated in a timely manner to cope with new challenges, such as incomplete regulations on the recycling and disposal of electric vehicle batteries and the safety management of distributed generation systems connected to the power grid.

3.3.2 Insufficient regulatory system and coordination mechanism

The regulatory system for China's new energy industry is jointly participated by multiple institutions, including the National Energy Administration, the National Development and Reform Commission, and the Ministry of Ecology and Environment. [6]The boundaries of responsibilities between these departments are blurred, and there is a phenomenon of functional overlap and duplication, which may lead to regulatory gaps or duplicate management issues. For example, in the environmental assessment and approval stage of new energy projects, there may be differences in requirements from different government departments, which increases the cost of compliance for enterprises and challenges in the project promotion process. In addition, the regulatory standards and enforcement efforts for the new energy industry vary from place to place, with some regions having more relaxed regulations and less strict enforcement; In other places, stricter measures may be taken, which may affect the investment willingness of enterprises. This regional imbalance is not conducive to the healthy and orderly development of the entire new energy industry. The lack of effective coordination mechanisms is also a significant issue in promoting the coordinated development of new energy and other related fields. Taking the construction of electric vehicle charging facilities and the coordination between distributed power sources and distribution networks as an example, the connection between planning, implementation, and operation is not smooth enough, which poses obstacles to improving the utilization rate of new energy.

3.3.3 Market supervision and incentive mechanism issues

Although certain entry barriers have been established in the new energy market, these standards still need to be further improved. Currently, there is a phenomenon in the market where some companies are eager to enter without sufficient preparation, which to some extent disrupts the normal competitive order of the market. Some companies may not have sufficient technological reserves or financial strength, but they obtain project resources through informal means, which has a negative impact on the quality and efficiency of the entire industry. In addition, several problems have been exposed in the practical operation of the new energy subsidy policy, such as uneven allocation of subsidy funds and insufficiently scientific subsidy rules. Some companies may exaggerate the scale or power generation capacity of their projects in pursuit of subsidy benefits, resulting in fraudulent or abusive subsidies. This not only wastes public financial resources but also damages market fairness. Finally, there are still shortcomings in the trading mechanism of the new energy electricity market, as market prices have not effectively reflected the true value and cost of new energy. For example, when implementing the responsibility weight system for the consumption of renewable energy electricity, some regions have failed to strictly enforce relevant regulations, which poses challenges to the effective utilization of new energy electricity and affects the profits and development momentum of related enterprises.

3.3.4 Technical and security regulatory challenges

With the rapid advancement of new energy technologies, regulatory agencies have been relatively slow in formulating relevant technical standards. For various new energy storage technologies, including lithium-ion battery energy storage and flow battery energy storage, there is still a lack of unified technical specifications and safety standards in terms of performance requirements, safety guarantees, and system integration, which brings certain safety risks to practical applications.

The safety management of new energy projects faces significant challenges, especially for distributed new energy facilities. Due to their widely dispersed nature, regulatory resources appear relatively limited. Some new energy enterprises have unsatisfactory performance in safety management, manifested as weak safety awareness and insufficient configuration of necessary safety equipment, which increases the possibility of accidents. For example, in terms of fire prevention, lightning protection, and leakage prevention, some photovoltaic power plants have potential safety hazards; In wind power projects, safety hazards are prone to occur in equipment maintenance and operation management. With the development of the new energy industry towards digitization and intelligence, network security issues have become increasingly prominent. The high integration of power generation devices and power grid control systems with the Internet has improved efficiency but also brought a greater threat of network attacks. However, the current regulatory measures for cybersecurity in the field of new energy are still insufficient, lacking sufficient defense mechanisms and technological means to effectively address these emerging risks.

4. The Path to Improving the New Energy Regulatory System

Currently, the global energy system is undergoing a profound transformation, and the new energy sector, as an emerging force, shoulders the responsibility of leading human society into a more environmentally friendly future. However, while it is developing rapidly, it also exposes the shortcomings in legal supervision. [7]Whether it is the lack of a legal and regulatory system, the mismatch between regulatory mechanisms, or the disorderly state of market operation and the lagging phenomenon of technical safety supervision, these issues have become key factors hindering the new energy industry from achieving greater breakthroughs. In order to fully tap into the potential of the new energy industry, it is necessary to conduct a comprehensive review of its current legal regulatory framework and improve it through the implementation of systematic improvement measures, thereby providing solid guarantees for the healthy, efficient, and sustainable growth of the industry and guiding it along a stable and hopeful path.

4.1 Improve the legal and regulatory system

In the process of transitioning to a green and low-carbon model in today's world, the new energy industry has rapidly emerged as an important pillar for promoting sustainable economic growth and addressing global climate change. At present, the Energy Law, as a leading and guiding regulation, has been introduced, and China has established a relatively complete legal framework in the field of energy. However, there are still shortcomings in the construction of laws and regulations in the field of new energy. To address the legal gaps and inconsistent enforcement standards in emerging fields, efforts can be made to improve the energy regulatory system from the following aspects.

For emerging new energy sectors such as hydrogen energy and ocean energy, government departments should establish specialized legal provisions to define the regulatory framework governing their development, utilization, and storage. This will lay a solid legal foundation for the growth of related industries. At the same time, a comprehensive review and refinement of current laws and regulations related to new energy should be carried out, such as further standardizing the

approval procedures for new energy projects, setting clear standards, and dividing the responsibilities of relevant departments, in order to eliminate ambiguity and regional differences in rules and ensure the consistent implementation and practicality of regulations nationwide.

The legal system needs to keep pace with technological progress. A flexible legal update framework should be established to continuously track the development trends of new energy technologies and quickly incorporate new challenges introduced by new technologies into the regulatory scope of laws and regulations. For example, in dealing with the recycling of new energy vehicle batteries, detailed regulatory provisions should be introduced to clearly define the conditions required for battery recycling enterprises, specific recycling processes, environmental protection standards, and the responsibilities of all parties involved, in order to promote the healthy development of the battery recycling industry; Clear safety technical specifications and corresponding management measures need to be established to address the potential security issues that may arise after the integration of distributed energy into the power grid, in order to ensure the safety and stability of the power system.

4.2 Optimize regulatory system and coordination mechanism

With the rapid progress of the new energy industry, establishing a sound and effective regulatory framework and cooperation mechanism has become increasingly crucial. At present, there are problems such as unclear functional division, inconsistent local regulations, and insufficient cross industry cooperation in this field, which greatly restrict the improvement of industrial efficiency and the effective utilization of resources. Therefore, it is urgent to establish a scientific, reasonable, and efficient management system and coordination mechanism to overcome existing challenges[8].

The established energy regulatory system should clearly define the functional scope of each relevant department and strengthen cross-departmental coordination and supervision. Specifically, the role positioning of institutions such as the National Energy Administration, National Development and Reform Commission, and Ministry of Ecology and Environment in the management of the new energy industry should be further refined to reduce the phenomenon of work overlap or conflict caused by unclear responsibilities. Therefore, it is suggested to establish an effective communication and coordination mechanism with the goal of "strengthening energy regulatory coordination, improving regulatory efficiency, and establishing an energy regulatory information system according to work needs" as stipulated in Article 65 of the Energy Law. For example, regular multi-party participation meetings should be set up to discuss key issues and regulatory challenges encountered in the development of new energy fields, so as to gather the strength of all parties to jointly solve problems. Especially in the environmental impact assessment and approval process of new energy projects, promoting information exchange and synchronous operations through the development of consistent operating guidelines and joint approval processes can not only improve the efficiency of regulatory work, but also simplify enterprise procedures.

A sound energy regulatory system should unify regulatory standards while taking into account regional characteristics. It is essential to establish a set of nationwide management standards for the new energy industry, ensuring that all regions adhere to consistent requirements in project approval, construction and operation, as well as safety and environmental protection. On this basis, the specific conditions of each region should also be fully considered, and a certain degree of flexibility and differentiated policy support should be provided to prevent the occurrence of overly strict or insufficient regulation. In addition, local regulatory agencies should strengthen guidance and supervision, and establish a mechanism for regularly evaluating regulatory effectiveness to ensure that each region can strictly implement established standards, adjust regulatory intensity reasonably, and promote the healthy and coordinated development of the new energy industry nationwide.

Enhance the coordination mechanism for inter-industry collaborative development within the energy regulatory framework. It is suggested to establish a specialized agency at the national level, which will be responsible for coordinating the coordinated development of the new energy industry with other related industries, including formulating corresponding plans and policy measures, and coordinating the planning and project execution in areas such as new energy vehicles and their supporting charging facilities, distributed energy systems and distribution networks. For example, by establishing unified standards and layout plans for charging facility construction, clarifying the allocation of responsibilities between power companies and charging service providers, the synchronous development of the electric vehicle industry and charging infrastructure construction can be promoted; At the same time, it is necessary to establish an effective system for collaborative operation between distributed energy and the power grid, in order to optimize power allocation and load management processes, thereby improving the absorption rate and utilization efficiency of new energy resources.

4.3 Establish sound market supervision and incentive mechanisms

With the acceleration of the global energy transition, the new energy industry has become a key force driving economic growth and environmental protection. However, there are still problems in this field, such as unreasonable market access standards, chaotic market competition environment, further improvement of fiscal subsidy system, and incomplete trading rules. In order to address these issues, it is necessary to follow the guidance of Article 6 of the Energy Law, which states that "the state shall accelerate the establishment of a diversified, unified, open, competitive, orderly, and effectively regulated energy market system, regulate the energy market order in accordance with the law, and equally protect the legitimate rights and interests of all types of entities in the energy market", and improve the existing energy regulatory system from multiple aspects to activate the potential of the new energy market and ensure the sustainable and healthy development of the industry.

The government should optimize market access mechanisms and regulate market competition practices. To ensure the healthy development of the new energy sector, it is necessary to further improve the admission standards of relevant markets and screen out more competitive enterprises by raising the threshold. Therefore, it is recommended to establish a comprehensive enterprise qualification review system, covering multiple dimensions of evaluation indicators such as technical capabilities, financial status, management efficiency, and integrity records, in order to prevent low-quality enterprises from disorderly entering the market. In addition, it is necessary to strengthen the supervision of competitive activities in the market, and to severely investigate and punish improper behaviors such as price manipulation, malicious low price bidding, and false project declarations, in order to create a fair and transparent competitive environment and promote the long-term stable development of the new energy industry.

Government departments should conduct comprehensive evaluations and optimizations of the new energy subsidy policy, while strengthening the fund supervision mechanism. Based on the different stages of industrial development and the specific situation of technological progress, reasonable subsidy standards and scope should be set to ensure that funds can effectively support new energy projects and enterprises that are technologically advanced, have high energy utilization efficiency, and have development potential. At the same time, we should increase supervision over the use of subsidy funds and establish a rigorous system for fund review, distribution, and recovery. Relevant authorities should utilize advanced technologies such as big data analysis and blockchain to achieve end-to-end tracking and monitoring of subsidy projects, thereby effectively preventing fraudulent claims and enhancing the efficiency and security of subsidy fund utilization.

The government should optimize the market system to better reflect its intrinsic value. We should

further improve the operational mechanism of the new energy electricity market, construct a diversified market framework including spot electricity market and ancillary service market, increase the types and forms of market transactions, and enable the market to play a core role in resource allocation. By implementing a reasonable pricing strategy, we ensure that the price of new energy electricity can truly reflect production costs, environmental benefits, and market supply and demand conditions, thereby enhancing the profitability and development potential of new energy enterprises. For example, by improving the market trading rules under the responsibility weight system for renewable energy power consumption, we can incentivize the adoption of market-oriented methods to promote cross regional circulation and efficient allocation of new energy power, thereby promoting the large-scale growth of the new energy industry.

4.4 Strengthen technology and safety supervision

With the rapid development of the new energy industry, technological innovation and its applications continue to advance, providing strong support for the transformation of the energy structure. However, in this process, problems in technology and security management have become increasingly prominent, posing significant challenges to the long-term healthy development and stable operation of the industry. In order to ensure the steady progress of the new energy industry, it is necessary to establish a comprehensive and multi-level technology and safety management system from multiple dimensions.

Relevant departments should promptly establish technical standards and safety regulations. It is recommended to establish a specialized institution or expert group responsible for the standardization of new energy technologies, and strengthen cooperation with research institutions and enterprises to continuously monitor the latest developments in new energy technologies. Through this mechanism, unified technical standards and safety guidelines covering new energy technologies and equipment can be developed and optimized. These standards cover performance indicators, quality requirements, safety protection measures, installation and commissioning guidance principles, as well as operation and maintenance guidelines for power generation equipment. This not only provides clear technical reference for enterprises, but also creates conditions for effective supervision by regulatory authorities, thereby ensuring the reliability of the new energy industry in terms of technology and safety.

Relevant authorities and enterprises should strengthen safety management and enhance safety awareness. We should strengthen the safety supervision of new energy projects, increase the number of professional regulatory personnel, and improve the technical equipment for safety supervision, in order to enhance the professional level and practical effectiveness of supervision. The government should establish a regular safety inspection system to periodically and randomly verify the implementation of safety production systems, the configuration of safety facilities, and employee safety education in new energy enterprises, in order to promptly identify and eliminate potential safety hazards. In addition, it is necessary to increase investment in safety education and training for new energy enterprises, enhance the sense of safety responsibility of enterprises and employees, encourage enterprises to improve their internal self-management mechanisms, and ensure the smooth operation and long-term stability of new energy projects.

Relevant departments should strengthen cybersecurity supervision and protection strategies. Given the security challenges arising from the digital and intelligent transformation of the new energy industry, it is necessary to introduce specialized laws, regulations, and standard systems for network security in this field, clearly defining the main responsibilities and obligations of new energy enterprises in ensuring network information security. We need to strengthen the security monitoring of key infrastructure such as new energy production equipment, power dispatch systems, and energy

management information systems, establish a network security monitoring and early warning mechanism, and achieve continuous tracking of security situations in order to quickly identify and respond to potential network threats. In addition, enterprises should be incentivized to increase investment in network security technology research and facility upgrades, adopting various advanced security technologies such as data encryption, intrusion detection and defense, identity verification, etc., to enhance the network security protection level of the entire new energy industry.

In summary, with the rapid development of China's new energy industry, strengthening legal supervision in the energy sector has become particularly urgent. From the perspective of building a legal and regulatory system, filling existing regulatory gaps and refining relevant provisions to ensure that the legal framework can keep up with technological progress is crucial for consolidating the legal foundation of the industry. In terms of optimizing regulatory mechanisms and collaboration models, clarifying the responsibilities of relevant departments, unifying regulatory standards, and enhancing cross departmental cooperation can significantly improve regulatory efficiency and the rationality of resource allocation. Regarding market regulation and incentive measures, improving market access rules, adjusting subsidy policies, and perfecting transaction processes are conducive to stimulating the intrinsic vitality of the market and promoting the healthy and stable growth of the industry. In addition, in terms of technology and security, establishing strict technical specifications, strengthening the security awareness of practitioners, and enhancing network protection capabilities are key to ensuring the long-term stable operation of the new energy industry. Only by establishing a scientific, rational, efficient, and comprehensive legal regulatory system can China's new energy industry steadily advance in the global trend of green and low-carbon development, and contribute to economic prosperity, environmental improvement, and energy structure transformation.

5. Conclusion

The rise of the new energy industry marks the arrival of a new era, which is not only an important means to address global challenges, but also a valuable opportunity bestowed upon us by the times. Through a comprehensive examination of the legal regulatory system in China's energy sector, from legislation to implementation, we deeply appreciate the urgency and necessity of improving this institutional framework. Establishing a more comprehensive legal and regulatory system can provide clear direction and boundaries for the development of the new energy industry, ensuring that all related activities have laws and regulations to follow; Government departments should optimize the existing regulatory structure and coordination mechanisms, eliminate barriers between departments and regions, promote effective integration of resources from all parties, and ensure the steady development of the industry; establish sound market supervision and incentive policies, stimulate market innovation potential and vitality, and ensure the healthy and orderly growth of the new energy industry; strengthen technological safeguards and security measures, provide solid support for the application and development of new energy technologies, and fully tap their potential on the premise of safety and stability. Once a scientifically reasonable and efficient energy legal regulatory system is established, the new energy sector will usher in unprecedented development opportunities. This move will not only help China occupy a favorable position in the global green and low-carbon transformation process, enhance international competitiveness, but also continue to inject green momentum into economic growth, make significant contributions to environmental protection, promote the smooth transformation of energy structure, and ultimately achieve the beautiful vision of harmonious coexistence between humans and nature. Let us join hands with unwavering determination and effective measures to continuously improve the energy legal regulatory system, help the new energy industry shine in the new era, create a cleaner and better living environment for future generations, and jointly move towards a sustainable development future, opening a new

chapter in energy utilization and human civilization progress.

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