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Development Trends and Solutions for Comprehensive Energy Services in the Context of Green and Low-Carbon Initiatives

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Abstract: In the context of global green and low-carbon development, comprehensive energy services act as a pivotal transformative force within the energy sector. They play a crucial role in facilitating energy transitions and achieving carbon neutrality goals. This paper thoroughly analyzes the intrinsic relationship between green low-carbon initiatives and comprehensive energy services, offering accurate insights into their development trends. It systematically outlines the challenges encountered in this field and proposes targeted, practical response strategies. The aim is to provide both theoretical support and practical guidance for the sustainable and healthy development of this sector.

Keywords: Green Low-Carbon; Comprehensive Energy Services; Development Trends

1. Introduction

1.1 Research Background and Significance

In today's world, the crisis caused by climate change is becoming increasingly severe, with issues such as glacial melting, rising sea levels, and frequent extreme weather events posing significant threats to the human living environment. In this context, the transition to a green and low-carbon development model has emerged as a global consensus, with reforms in the energy sector being a core aspect of this transition. Integrated energy services, as an innovative service model that combines various energy resources and encompasses the entire chain of energy production, transmission, distribution, storage, and consumption, can effectively enhance energy utilization efficiency and reduce carbon emissions.

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Consequently, these services play a crucial role in supporting the achievement of carbon neutrality goals[1].

From the perspective of energy development, the traditional energy system faces numerous challenges, including resource depletion, low energy efficiency, and environmental pollution. Integrated energy services introduce clean energy solutions and optimize energy allocation, infusing new vitality into the energy sector and facilitating the transition towards a cleaner and more diversified energy structure. Economically, this shift has given rise to a series of emerging industries, such as the energy internet and the research and manufacturing of energy storage technologies, which drive the coordinated development of both upstream and downstream industries, thereby becoming a new engine for economic growth. Furthermore, in terms of environmental protection, reducing pollutant emissions during energy production and consumption alleviates ecological pressure and fosters a harmonious coexistence between humans and nature. Therefore, conducting in-depth research on the development of integrated energy services within the framework of green and low-carbon initiatives is of significant and far-reaching practical importance.

1.2 Current Research Status Domestically and Internationally

Developed countries have made significant strides in the field of integrated energy services, achieving remarkable results in both technological research and practical applications. In terms of technology, Europe has successfully implemented large-scale grid connections for offshore wind power through advanced wind generation technologies and smart grid control systems.[2] This ensures the stability and reliability of energy supply via distributed energy management systems. The United States emphasizes the combined use of natural gas and renewable energy, providing communities with energy through microgrids, thereby reducing dependence on external power transmission. In terms of policy, Germany has introduced the "Energy Transition Plan" (Energiewende), which incentivizes the development of clean energy through fixed feed-in tariffs and subsidies, while also establishing stringent energy efficiency standards to regulate the market. In response to the energy crisis, Japan has formulated a "Comprehensive Energy Resource Strategy" aimed at enhancing inter-departmental collaboration to promote the implementation of energy projects[3]. In market practice, the Netherlands' "Energy Valley" has attracted numerous energy companies and research institutions, creating an innovative hub for integrated energy services that combines production, academia, research, and application. Reason: Improved clarity, vocabulary, and technical accuracy while maintaining the original meaning[4].

Domestic research has experienced vigorous development in recent years, with various regions exploring development models that align with local resource characteristics. This has resulted in integrated models such as "source-network-load-storage" in industrial parks and urban energy systems. However, in the face of rapidly growing demand, several issues remain apparent. On one hand, technological bottlenecks must be addressed, as the efficiency and stability of multi-energy coupling are inadequate, and the level of intelligent control is insufficient. On the other hand, the policy framework is still imperfect, characterized by poor inter-departmental policy coordination, gaps in market access and regulation, and an unreasonable price formation mechanism. Although many scholars have proposed countermeasures to these challenges, further refinement and deepening of these strategies are necessary to align with the complex and evolving market realities.

1.3 Research Methods and Innovations

This paper employs a variety of research methods. The literature review method extensively examines domestic and international academic journals, policy documents, and industry reports to gain a comprehensive understanding of cutting-edge dynamics and to outline theoretical frameworks, thereby establishing a solid foundation for the research. The case analysis method selects representative integrated energy service projects from both domestic and international contexts, such as China's Shanghai Chongming Ecological Island Energy Project and Denmark's Kalundborg Eco-Industrial Park Project. This approach allows for an in-depth analysis of successful experiences and lessons learned, revealing development patterns through specific examples. The comparative research method conducts

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horizontal comparisons of differences in technology, policy, and market strategies among various countries, regions, and types of enterprises to explore optimal pathways.

The innovation lies in an interdisciplinary perspective that integrates knowledge from energy science, economics, and management, offering a comprehensive interpretation of integrated energy services and overcoming the limitations of a single discipline. Systematic thinking permeates the research, analyzing the interrelations among technology, policy, and market dynamics from multiple dimensions to construct a holistic development framework and avoid isolated studies. Simultaneously, a forward-looking vision emphasizes future trends, combining emerging technological dynamics and policy directions to anticipate industry trajectories, thereby providing proactive guidance for enterprise strategy formulation and policy optimization.

2. The Relationship Between Green Low-Carbon Development and Integrated Energy Services

2.1 Analysis of the Green Low-Carbon Development Concept

The concept of green low-carbon development is rooted in sustainable development, with its primary goal being to minimize the adverse effects of human activities on the natural environment. This is particularly achieved by reducing greenhouse gas emissions and safeguarding the ecological balance of the Earth. The concept encompasses various domains, including the greening of energy, low-carbon industrialization, and environmentally friendly lifestyles. According to data from the International Energy Agency (IEA), global carbon emissions continue to rise, with emissions from energy consumption accounting for over 70% of the total. As a major energy consumer, China faces a similarly critical carbon emission challenge. In this context, the transition of the energy sector to green low-carbon practices is both urgent and represents a crucial breakthrough in reversing the trends of climate change[5].

2.2 Definition of Integrated Energy Services

Integrated energy services have a dual connotation. In a narrow sense, it emphasizes multi-energy collaboration within the energy system, integrating various forms of energy such as electricity, heat, and gas. This approach optimizes the production, transmission, and distribution of energy while achieving cascading utilization. For instance, a regional energy station project in a city recovers waste heat from a nearby power plant to provide heating and cooling for surrounding buildings. This system is complemented by a photovoltaic power generation setup to ensure a reliable regional electricity supply and enhance overall energy utilization efficiency. In a broader sense, integrated energy services extend to the cross-sector integration of energy with other fields. This includes the development of an energy internet through the convergence of energy and information communication technology, as well as innovative energy investment and operational models linked to financial services. Such integration empowers socio-economic development across all sectors.

2.3 The Intrinsic Compatibility of the Two

Integrated energy services are highly compatible with the green low-carbon concept. From the perspective of energy utilization efficiency, strategies such as multi-energy complementarity and energy storage regulation can help smooth out peaks and fill in valleys, thereby reducing energy waste. For example, the integration of wind power and solar power with energy storage batteries stabilizes power output and enhances the reliability of energy supply, thereby decreasing reliance on high-carbon energy sources during periods of energy shortages. In terms of environmental benefits, the large-scale promotion of clean energy utilization reduces the reliance on traditional fossil fuels, thereby decreasing pollutants and greenhouse gas emissions at the source and contributing to ecological restoration. Furthermore, optimizing the energy structure gradually increases the share of renewable energy within the overall energy consumption framework, facilitating the transition of the energy supply system toward low-carbon and sustainable practices. This approach aligns with the long-term objectives of green, low-carbon development[6].

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

3. Development Trends of Integrated Energy Services in the Context of Green Low-Carbon Initiatives

3.1 Driven by Technological Innovation

3.1.1 Deep Integration of New Energy Technologies

The momentum for the integrated development of new energy technologies is robust. For instance, a specific offshore wind power and hydrogen production integrated demonstration project in China boasts an installed capacity of 500,000 kilowatts and can generate up to 10,000 tons of hydrogen annually. This amount of hydrogen is sufficient to power 1,000 fuel cell vehicles for an entire year, effectively addressing the challenges associated with wind power consumption. This collaborative model of wind power, hydrogen production, hydrogen storage, and hydrogen utilization not only mitigates the issue of wind power consumption but also broadens the applications for new energy utilization. It enhances the stability and reliability of the energy system while paving new pathways for the large-scale integration of renewable energy sources[7].

3.1.2 The Crucial Role of Energy Storage Technology

Energy storage technology has become a fundamental component of integrated energy services. In power systems, energy storage devices can mitigate the intermittency and volatility associated with renewable energy generation. For example, lithium battery storage systems can achieve a charge and discharge efficiency exceeding 90%, with response times in the millisecond range. This capability allows for the rapid storage of electricity during periods of low prices and discharging during peak demand times, thereby participating in power peak shaving and frequency regulation to ensure the quality of power supply. Pumped storage, as a large-capacity energy storage method, plays a crucial role in balancing supply and demand within the grid due to its established technology and relatively low cost. Each energy storage technology has its own advantages and disadvantages and is rapidly evolving towards higher energy density, longer lifespan, and lower costs to meet diverse energy storage requirements[8].

3.1.3 Construction of the Energy Internet

The energy internet represents an advanced form of integrated energy services. Taking the Suzhou Energy Internet Comprehensive Demonstration Project as a prime example, it utilizes cutting-edge information and communication technology to facilitate comprehensive interconnection among energy production, transmission, and consumption. This enables real-time collection, transmission, and precise analysis of energy data. Leveraging big data and artificial intelligence, intelligent scheduling systems can optimize energy distribution paths based on user consumption patterns and real-time energy prices. This approach enhances energy efficiency and minimizes losses, thereby ushering in a new era of intelligent energy management[9].

3.2 Policy Guidance

3.2.1 Policy Promotion Under National Dual Carbon Goals

The establishment of China's dual carbon goals has injected significant momentum into integrated energy services. At the national level, a series of policies have been introduced, including the "Guiding Opinions on Promoting the Development of Integrated Energy Services", which clarifies development directions and key tasks, thereby providing a comprehensive framework for the industry. Additionally, subsidy policies for "integrated wind and solar storage" encourage enterprises to invest in clean energy. Furthermore, incentive mechanisms such as the "Energy Efficiency Leader" system and carbon emission trading compel enterprises to enhance energy utilization efficiency and reduce carbon emissions, thereby promoting the standardized and large-scale development of integrated energy services[10].

3.2.2 Implementation of Local Support Policies

Local governments have developed supportive policies tailored to their specific conditions. For example, Shanghai has implemented special funding initiatives, with a total investment of 1 billion yuan, to assist

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

local integrated energy service companies in technology research and project demonstrations. This has attracted a significant number of high-end talents and quality projects. In Hebei, the focus is on energy construction in the Xiong'an New Area, where policy incentives are provided for distributed energy grid connections and microgrid operations, aiming to increase the proportion of clean energy in the area to 30%. Meanwhile, Shenzhen capitalizes on its technological innovation advantages by establishing an energy technology innovation industrial park, which has attracted over 500 enterprises and fostered an industrial agglomeration effect, thereby creating a favorable development environment for integrated energy services[11].

3.3 Market Demand Pull

3.3.1 Energy Efficiency Improvement Needs in the Industrial Sector

As a major energy consumer, the industrial sector urgently requires improvements in energy efficiency. A specific steel company's energy management project has yielded significant results, with integrated energy service providers performing a comprehensive assessment of the company's energy system, tailoring energy optimization plans, and implementing technologies such as waste heat recovery and variable frequency drive regulation. These efforts have led to enhanced energy management practices. This initiative not only substantially reduces the company's energy costs—saving 50 million yuan annually and improving product competitiveness—but also serves as a model for green, low-carbon transformation within the industrial sector, encouraging more enterprises to adopt integrated energy services.

3.3.2 Demand for Green Energy in the Building Sector

In the building sector, the utilization of green energy has become a prominent trend. Commercial buildings, such as large shopping centers and office complexes, have adopted technologies like ground-source heat pumps and air-source heat pumps, integrated with intelligent control systems. These systems enable the simultaneous supply of heating, cooling, and electricity, adjusting energy output in real-time based on both indoor and outdoor conditions. This approach enhances indoor comfort while reducing energy consumption by 30%. Additionally, residential communities are promoting solar water heaters and distributed photovoltaic power generation, coupled with energy storage devices to create household micro-energy systems. This initiative allows for surplus electricity feed-in and increases residents' energy self-sufficiency rate to 20%, steering buildings towards greener, low-carbon, and more intelligent solutions[12].

3.3.3 Development Needs for Distributed Energy Resources and Microgrids

Distributed energy systems and microgrids address the growing market demand for decentralized energy utilization and enhanced energy self-sufficiency. For instance, a distributed energy microgrid project at a specific technology industrial park has established a natural gas distributed energy station and a rooftop photovoltaic power generation system, complemented by supporting energy storage facilities. This configuration has created an independently operating micro-energy network that meets the energy needs of 80% of the enterprises within the park, reducing transmission losses to 5%. Furthermore, it can ensure continuous operations in the park for 24 hours in the event of sudden power outages, positioning it as a crucial supplementary source of future energy supply[13].

4. Challenges Faced by Comprehensive Energy Services in the Context of Green, Low-Carbon Development

4.1 Technical Bottlenecks

4.1.1 Challenges in Multi-Energy Coupling Technology

Multi-energy coupling technology faces numerous challenges in practical applications. The tri-generation system, which simultaneously provides heating, electricity, and cooling, serves as a typical example. Although it theoretically enables hierarchical energy utilization, the dynamic matching of

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

heating, electricity, and cooling load demands is complex during actual operation. The slow response times in equipment start-stop cycles and adjustments to operating conditions often result in energy waste or insufficient supply. Additionally, significant efficiency losses occur at various stages of energy conversion, and factors such as energy quality and pipeline transportation conditions hinder the achievement of optimal comprehensive energy utilization. These limitations ultimately restrict the overall improvement of the system's energy efficiency[14].

4.1.2 Challenges in System Integration and Optimization

The integration of comprehensive energy systems encounters several challenges, including technological disparities, varying standards, and incompatible interfaces. Equipment from different energy subsystems is produced by various manufacturers, leading to significant differences in technical approaches, communication protocols, and data formats. These discrepancies result in inadequate data interaction and complicate control coordination during system integration, ultimately impacting project timelines and operational costs. Furthermore, the absence of a unified system optimization design methodology complicates the assessment of investment, operational, and environmental benefits from a holistic lifecycle perspective, thereby impeding the assurance of optimal performance in comprehensive energy systems.

4.1.3 Barriers to Enhancing Levels of Intelligent Management

There are still shortcomings in energy intelligent management. During the energy data collection phase, suboptimal sensor placement and insufficient accuracy can lead to data loss or significant errors. The transmission process is constrained by network bandwidth and stability, resulting in data delays and interruptions. At the analysis level, big data mining algorithms remain underdeveloped, making it challenging to extract meaningful information from vast datasets to accurately predict energy demand and equipment failures. Furthermore, the application of intelligent control algorithms is limited, preventing adaptive regulation of energy systems based on real-time operating conditions, which hinders the advancement of intelligent capabilities[15].

4.2 Inadequate Policy Mechanisms

4.2.1 Insufficient Policy Coordination

The current policy system suffers from inadequate coordination. Policies related to energy, environmental protection, and industrial sectors operate independently, with subsidy programs dispersed across various fields and lacking integration. For instance, the subsidies for clean energy generation and energy efficiency improvements have not been linked, making it challenging for enterprises to utilize them comprehensively, thereby diminishing the synergistic effects of policy incentives. Additionally, there is a disconnect between policy formulation and implementation; while some regions have introduced policies, the execution details remain unclear, and the approval processes are cumbersome. This results in policies being "suspended" and unable to be effectively implemented.

4.2.2 Market Access and Supervision Issues

The definition of market access thresholds is ambiguous, resulting in disordered competition. Some enterprises, lacking the necessary technical and financial resources, enter the market and capture market share through low pricing strategies. This disrupts market order and compromises service quality, ultimately harming the industry's reputation. Regulatory bodies are fragmented, with overlapping responsibilities among the energy, housing construction, and market supervision departments. This situation leads to both regulatory gaps and redundant oversight, which undermines the supervision of comprehensive energy service projects throughout their lifecycle. Consequently, it becomes challenging to identify and rectify violations in a timely manner[16].

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

4.2.3 Incomplete Pricing Mechanism

The energy pricing mechanism has not adequately reflected costs and environmental values. For an extended period, traditional energy prices have remained low, failing to account for resource extraction and ecological restoration costs. This situation undermines the competitiveness of clean energy. Furthermore, the pricing of comprehensive energy service products lacks a scientific foundation and does not incorporate additional values such as energy synergy and efficiency improvements. As a result, this oversight negatively impacts enterprises' expectations for investment returns, hinders rational resource allocation, and poses a threat to the healthy development of the comprehensive energy service market[17].

4.3 Market Competition and Cooperation Dilemmas

4.3.1 Intense Industry Competition

The competition in the comprehensive energy service market is intense. Traditional energy companies capitalize on their resource and pipeline advantages to expand into new areas, while electricity sales companies leverage their power trading experience to enter the market. Additionally, energy-saving service providers utilize energy efficiency improvement technologies as a "foot in the door to capture market share, resulting in significant homogenization of competition. Small and medium-sized comprehensive energy service providers face constraints related to funding, technology, and brand recognition, making it difficult for them to compete in large project tenders and market expansion. This situation leads to low market concentration and fragmented resources, ultimately hindering the overall development efficiency of the industry.

4.3.2 Barriers to Cross-Field Cooperation

Cross-sector collaboration encounters numerous challenges. When energy companies partner with firms in construction, information technology, and other industries, they face significant conceptual differences. Energy companies prioritize energy supply, construction firms focus on building functionality, and information technology companies concentrate on research and development, resulting in elevated communication and coordination costs. Additionally, unequal profit distribution acts as a "reef" in these collaborations, as varying expectations for project returns can lead to substantial disagreements during the investment, operation, and profit-sharing phases. The difficulty of technology integration is considerable, as disparate fields often have incompatible technical standards and interfaces, which impede joint technological advancements and project progress.

5. Strategies and Recommendations for Addressing Challenges

5.1 Pathways to Technological Innovation Breakthroughs

5.1.1 Increase Research and Development Investment and Talent Development

Enterprises, universities, and research institutions should collaborate to enhance research and development (R&D) investment. For example, a specific province has created a special fund of 100 million yuan aimed at facilitating key technological breakthroughs in multi-energy coupling and energy storage. Universities should optimize their energy-related academic programs and introduce interdisciplinary courses, such as energy-information integration technology and energy economics, to develop versatile talent. Additionally, enterprises and universities should jointly establish internship programs to offer practical opportunities for students, thereby achieving "order-based" talent cultivation and infusing new energy into technological innovation.

5.1.2 Collaborative Innovation Mechanism in Industry, Academia, and Research

Establish a close collaborative innovation alliance among industry, academia, and research institutions. Utilizing the comprehensive energy service project in the Xiong'an New Area as a catalyst, the government should spearhead the organization of energy companies and research institutions to create a joint research and development (R&D) center. This initiative has already initiated over ten project-

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

based collaborations aimed at addressing the green low-carbon energy needs of the new area. Enterprises will propose practical application scenarios and technical requirements, while research institutions will focus on technological R&D. The results will be rapidly verified and integrated into projects, thereby establishing a virtuous cycle of "R&D-application-feedback-improvement" that accelerates the technology implementation process[18].

5.2 Policy Optimization and Safeguard Measures

5.2.1 Enhance Policy System and Coordination Mechanism

At the top-level design stage, it is essential to integrate energy, environmental protection, and industrial policies, unify policy objectives, and develop specialized plans for comprehensive energy services that are aligned with dual carbon goals. This approach should clarify the responsibilities of various departments and enhance policy coordination. Additionally, it is important to optimize subsidy policies; for instance, a specific region may offer up to 50% subsidy support based on the comprehensive benefits of projects. Streamlining policy approval processes and establishing a green approval channel can reduce policy implementation time by 50%, thereby ensuring the effective execution of policies in the "last mile" and stimulating market vitality[19].

5.2.2 Strengthening Market Supervision and Regulation

To enhance regulatory efficiency, it is essential to establish a single regulatory body that integrates the functions of multiple departments and creates a professional regulatory agency dedicated to comprehensive energy services. This agency would unify regulatory standards and enforcement measures. Additionally, a full lifecycle supervision system should be implemented to monitor and oversee the entire process, from project planning and construction to operation and decommissioning. This system would incorporate third-party testing and evaluation to ensure service quality. Furthermore, a market credit system should be developed to quantify and score enterprises based on their operational integrity and service quality. This system would involve the public disclosure of credit information and the imposition of penalties on dishonest enterprises, thereby fostering a fair competitive market environment[20].

5.3 Development Strategies for Market Entities

5.3.1 Differentiated Competition Strategy for Enterprises

Enterprises should leverage their unique advantages to explore differentiated competitive strategies. Large energy companies can capitalize on their resource and technological strengths to concentrate on energy system integration and the construction of substantial energy infrastructure, thereby increasing their market share to 50%. Meanwhile, small and medium-sized service providers can focus on niche markets by offering energy audits and customized energy-saving renovation plans tailored for small and medium-sized enterprises. By delivering professional and flexible services, they can achieve a customer satisfaction rate of 90%. Additionally, electricity sales companies can enhance their value-added services by providing users with energy efficiency analyses and strategic recommendations for electricity usage based on big data. This approach can increase customer loyalty by 30% and facilitate differentiated breakthroughs in the market[21].

5.3.2 Strengthening Cross-Field Cooperation for Mutual Benefit

Advocate for the establishment of cross-industry alliances, led by industry associations, to regularly facilitate exchange activities among enterprises in the energy, construction, information technology, and other sectors. To date, five sessions have been conducted to enhance mutual understanding and explore cooperation opportunities. Develop a fair and equitable profit distribution mechanism by engaging third-party consulting agencies to assess project returns. Negotiate profit-sharing ratios based on factors such as contributions and risk exposure, aiming to increase the success rate of collaborations to 80%. Collaboratively establish technical standards to address challenges related to technological integration.

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

Utilize joint projects as a means to achieve resource sharing and technological complementarity, thereby promoting the cross-industry collaborative development of comprehensive energy services[22].

5.4 Summary of tables

The Table 1 offers a synopsis of the salient points from the three constituent parts of this paper: technological innovation, policy optimisation, and market strategy. The purpose of this table is to facilitate readers' swift comprehension of the strategies and recommendations proposed in this paper.

Table 1. A synopsis of the salient points.

Strategy Category	Specific Measures	Intended Effect
Technological innovation	Increase R&D investment and talent training, industry-university-research-use synergistic innovation	Enhance the ability of key technology breakthroughs and accelerate the transformation of technology applications
Policy optimization	Improve the policy system and synergistic mechanism, and strengthen market supervision and regulation.	Optimize the policy environment, ensure effective implementation of policies and enhance market order
market strategy	Competitive strategies for enterprise differentiation and strengthening cross-sectoral cooperation for win-win results	Improve market competitiveness, promote resource integration and realize synergistic development of the industry

6. Conclusion and Future Outlook

6.1 Summary of Research Conclusions

This paper explores the comprehensive landscape of energy service development within the context of green and low-carbon initiatives. It clarifies the deep integration of new energy sources driven by technological innovation, the essential support of energy storage, and the establishment of an energy internet. Fueled by policy guidance, both national and local initiatives are fostering robust industry growth. Market demand, particularly for energy efficiency in industries, buildings, and distributed energy sectors, is creating significant market opportunities. However, the path to development is fraught with challenges; technological bottlenecks, inadequate policy frameworks, and difficulties in market competition and collaboration impede progress. By advocating for breakthroughs in technological innovation, optimizing policy frameworks, and formulating strategies for market participants, this paper offers a comprehensive solution for the industry to navigate obstacles and advance steadily, thereby enabling comprehensive energy services to play a pivotal role in achieving carbon neutrality goals[23].

6.2 Future Development Outlook

Looking ahead, continuous technological advancements, along with the integration of new energy technologies, energy storage solutions, and information technologies, will give rise to innovative models such as virtual power plants and distributed energy clusters. These models are expected to be implemented on a larger scale, further enhancing the intelligence and efficiency of energy utilization. On the policy front, it is anticipated that policy coordination will continue to strengthen, subsidy policies will be accurately implemented, and the regulatory framework will become increasingly refined, creating a more favorable development environment for the industry[24]. In the market, companies will

Doi: https://doi.org/10.63333/eem.v1n11 Vol. 1 No. 1 (2025)

engage in differentiated competition and cross-sector collaboration, with resource integration and complementary advantages becoming the norm. Market concentration will gradually increase, with leading enterprises driving industry development, while small and medium-sized enterprises will focus on specialization and innovation, collectively promoting the prosperity and growth of the comprehensive energy service market[25]. According to predictions from the International Energy Agency, by 2030, the global comprehensive energy service market is expected to exceed $5 trillion. As a major energy consumer and a proponent of green development, China possesses immense market potential and is anticipated to capture a significant share, positioning itself as a benchmark for the global energy transition. However, it is crucial to closely monitor technological advancements, policy dynamics, and market fluctuations throughout the development process. Only through collaborative efforts can we navigate the wave of green and low-carbon initiatives toward the sustainable development of energy.

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