Proceedings of ICEMGD 2025 Symposium: Digital Transformation in Global Human Resource Management
DOI: 10.54254/2754-1169/2025.LD24977

The Impact of Blockchain Technology Enabling ESG Investment on the Valuation of New Energy Companies under the Background of "Dual Carbon"

Jiantao Ding

Lochlann Quinn School of Business, University College Dublin, Dublin, Ireland
3169361936@qq.com

Abstract. Under the background of the global dual carbon (carbon peak and carbon neutrality) goals , the development of new energy enterprises is closely related to ESG (environment, society and governance) investment. As the core force for achieving low-carbon transformation, the valuation system of new energy enterprises is undergoing a profound transformation from the traditional ESG comprehensive value of the index. At the same time, blockchain technology, with its decentralization and data immutability, provides innovative solutions for information disclosure and data management in ESG investment. However, existing research has not explored the mechanism by which blockchain technology empowers ESG investment to affect the valuation of new energy enterprises. This study aims to systematically sort out the impact mechanism and, through a comprehensive analysis of relevant literature, reveal the application value of blockchain technology in ESG investment and its role in improving the valuation of new energy enterprises, in order to fill the research gap. The study found that blockchain technology has shown significant advantages in improving the transparency of ESG data, reducing management costs and optimizing the decision-making process, providing technical support for ESG investment in new energy companies. ESG investment has a positive impact on the valuation of new energy companies through risk mitigation, brand premium and policy dividends, and forms a synergistic effect through multi-dimensional paths.

Keywords: dual carbon goals, blockchain technology, ESG investment, valuation of new energy companies

1. Introduction

By the global dual carbon (carbon peak and carbon neutrality) goals, the green and low-carbon transformation of the new energy industry driven by new industries and new models is urgent [1], and has become an important engine for achieving sustainable development. As the core carrier of this transformation, the development model of new energy companies has shifted from traditional scale expansion to a new stage where green innovation and social responsibility are equally important. As an important tool for measuring corporate sustainable development, ESG investment conducts systematic assessments around the dimensions of environment, society and governance [2].

DOI: 10.54254/2754-1169/2025.LD24977

It not only helps enterprises build a green development model and shape a responsible image, but also promotes their high-quality development through efficient governance mechanisms [3]. This shift has deeply embedded ESG factors into the corporate valuation system, reshaping the capital market's value perception and investment logic for new energy companies. At the same time, blockchain technology, with its unique advantages such as decentralization, data immutability and traceability, provides innovative solutions to solve the problems of data transparency and credibility in ESG investment. By building a real-time, shared information disclosure platform, blockchain technology can significantly improve the accuracy of ESG data, reduce information asymmetry caused by data lag or ambiguity, and thus enhance stakeholders' trust in new energy companies and ensure that information disclosure is timely and reliable [4]. Although there has been significant progress in the relevant research on ESG investment and blockchain technology, there is still a lack of research on the integrated application of the two in the specific field of new energy companies. Most literature either explores the financial impact of ESG investment in isolation or simply analyzes the application of blockchain in general industries. There is little systematic research on how blockchain technology can systematically enable ESG investment in new energy companies. Given the dual carbon goals, it's still not clear how blockchain technology can help turn ESG practices into increased value for companies, which is a major gap in current research and an important focus for this study. Based on the above background and gaps, this paper systematically sorts out the mechanism of "dual carbon goals → blockchain technology → ESG investment → new energy enterprise valuation" by reviewing existing literature, revealing the enabling effect of blockchain technology in ESG investment in new energy enterprises and its role in improving valuation.

2. Related concepts and research

2.1. “Dual carbon” goals and transformation of new energy industries

The "dual carbon" goal is an important strategy for the country's future development that China formally established in 2020. Its core connotation is to achieve significant results in green transformation and reach a peak in carbon emissions by 2030; to fully establish a green and low-carbon economy and energy dual system by 2060, reach an internationally advanced level of energy utilization efficiency, and achieve carbon neutrality . In order to achieve this goal, the Chinese government has introduced a series of policy measures, including promoting the development of renewable energy, accelerating the optimization of energy structure, and establishing a carbon trading mechanism. Studies have shown that the development of new energy is the key to energy transformation [5]. Therefore, under this policy background, the new energy industry, as an important pillar for achieving the "dual carbon" goal, will accelerate the energy transformation of high-quality development. However, new energy companies face multiple challenges in the transformation process. On the one hand, the lack of transparency and traceability of carbon emission data [6] affects the ESG rating and investor sentiment of companies; on the other hand, the existing valuation model is difficult to fully evaluate the technological innovation capabilities of new energy companies [7], resulting in insufficient financial support for companies and financing difficulties.

DOI: 10.54254/2754-1169/2025.LD24977

2.2. Blockchain technology empowers ESG investment mechanism

As a decentralized distributed ledger technology, blockchain technology has the core features of transparency, immutability and traceability, ensuring the security and reliability of platform transactions [8]. These characteristics have made blockchain widely used in the financial field, especially in the field of ESG investment, through encryption technology and data processing to ensure the transparency of speed and process, and improve the efficiency of investment decision-making [9]. In the field of new energy, the adaptability of blockchain technology is more prominent. With the proposal of the "dual carbon target", new energy projects have begun to show explosive growth. Because they often have the characteristics of high technical requirements, fast construction speed and stable investment returns , they have higher requirements for data management and sharing . However, since the project design involves constraints such as land and geographical location, it is particularly important to improve the efficiency of traditional site selection design methods [10]. Blockchain can realize cross - regional and multi-stakeholder data sharing and real-time updates by building a unified distributed data platform, thereby greatly reducing data integration and management costs. In addition, blockchain smart contracts can automatically execute green bonds and carbon trading contracts, reduce human intervention, and improve execution efficiency. Therefore, blockchain not only improves the transparency and efficiency of data management in the new energy field, but also promotes the realization of ESG goals through technical means such as smart contracts, becoming the key to promoting the digital transformation of new energy companies.

2.3. The adaptability of ESG investment theory to the new energy industry

ESG investment is a sustainable responsible investment concept that considers environmental protection, social responsibility, and corporate governance in portfolio selection and management [11] , aiming to achieve a balanced and unified economic value with environmental and social sustainable development. The ESG assessment of traditional industries mainly focuses on greenhouse gas emissions, social responsibility fulfillment, and corporate governance structure, and the assessment indicators and methods are relatively mature. However, the new energy industry has put forward new requirements for ESG assessment due to its unique technical characteristics and policy background. In terms of the environmental dimension, the carbon emissions of new energy companies mainly come from the production process and supply chain management, rather than the high operational emissions of traditional industries. Therefore, the ESG assessment of new energy companies should pay more attention to the carbon footprint and product recycling capabilities of the entire product life cycle. In terms of the social dimension, community participation and energy accessibility of new energy projects have become important considerations. In terms of governance, the R&D investment and technological innovation capabilities of new energy companies have become important indicators for evaluation .

2.4. Peculiarities of valuation of new energy enterprises

Traditional enterprise valuation models, such as the discounted cash flow model (DCF), mainly rely on the estimation of future returns of data assets, taking into account the time value factor, and converting the expected future returns into current value at an appropriate discount rate [12]. However, due to their unique asset structure and operating model, new energy enterprises face applicability challenges for traditional valuation models. First, new energy enterprises hold a large

DOI: 10.54254/2754-1169/2025.LD24977

number of special equity assets, such as carbon emission rights, green certificates, and renewable energy power generation quotas. These assets have the characteristics of non-physicality, tradability, and policy sensitivity, and their value assessment goes beyond the scope of traditional fixed assets. Secondly, the R&D investment and innovation results of new energy enterprises are difficult to fully reflect through traditional financial indicators, especially the investment in green technology innovation is of great significance to the long-term development of enterprises and social value creation [13]. In addition, ESG factors affect the valuation of new energy enterprises in many ways. For example, enterprises with high ESG scores enjoy lower financing costs in the capital market [14] and higher resource utilization [15]. At the same time, ESG performance directly affects the choice preferences of consumers and investors, forming an increase in the value of intangible assets.

3. ESG's impact on the valuation of new energy companies

ESG investment has a significant positive impact on the valuation of new energy companies through multiple paths, mainly reflected in three aspects: risk mitigation, brand premium and policy dividends. First, the risk mitigation path is an important way for ESG investment to affect corporate valuation. With the increasingly stringent global environmental regulations and the capital market's emphasis on sustainable development, companies with good ESG performance can gain significant advantages in financing costs and legal risks. For example, research shows that companies with good ESG performance may achieve better financial performance in the long run [16]. In addition, high ESG scores also reduce the legal and reputation risks faced by companies due to environmental violations, ensuring the long-term stable operation of companies. Secondly, the brand premium path is reflected in the positive correlation between ESG performance and corporate market value. By actively fulfilling their ESG commitments, new energy companies can not only enhance the market's awareness of their sustainable development capabilities, but also gain additional benefits in brand value and customer loyalty. For example, with its continuous supply chain emission reduction measures and transparent ESG disclosure, Longi Green Energy Technology Co., Ltd.'s overseas green bond yield is 0.5 percentage points lower than that of companies with the same rating, demonstrating the market's positive recognition of the company's ESG performance. Third, the policy dividend path reflects the additional value creation of ESG investment under policy support. With the establishment of the global carbon market, companies holding carbon emission rights can obtain additional income through market transactions. For example, new energy companies not only reduce their own carbon emission costs through their carbon emission rights, but also realize additional value acquisition through carbon market transactions. These policy dividends further enhance the overall valuation of enterprises. These paths do not exist in isolation, but form a complex interactive network. Good ESG performance not only directly reduces financial costs and enhances brand value, but also further consolidates and expands the space for obtaining policy dividends by improving regulatory adaptability and market trust. Ultimately, the combined impact of these factors significantly enhances the market valuation of new energy companies, making ESG an indispensable strategic factor for new energy companies.

4. Discussion

The transmission mechanism of "dual carbon goals → blockchain technology → ESG investment → new energy enterprise valuation" constructed in this paper essentially reveals the value creation path of the deep integration of technological innovation and sustainable finance. Blockchain technology injects new momentum into the valuation system of new energy enterprises by reconstructing the

DOI: 10.54254/2754-1169/2025.LD24977

ESG data governance paradigm: its distributed ledger characteristics solve the data island problem that is common in traditional ESG information disclosure, and smart contracts achieve dual added value of economic and environmental benefits [17]. This technology empowerment mechanism not only reduces the information search cost of ESG ratings, but also reshapes the pricing logic of the capital market by enhancing the credibility of data - as shown in the case of Longi Green Energy Technology Co., Ltd. can rely on transparent blockchain ESG data disclosure, and its overseas green bond yield is 50 basis points lower than that of its peers, which confirms the market premium effect brought by technology empowerment. However, the effective operation of this mechanism still faces three challenges: First, the problem of technical adaptability needs to be solved urgently. New energy projects are characterized by wide geographical distribution and complex asset types. The high energy consumption characteristics of the public chain and the node collaboration problems of the alliance chain may restrict the efficiency of technology implementation; second, the data governance paradox objectively exists. Although blockchain traceability improves data transparency, the lack of standardization of the carbon emission factor database leads to insufficient horizontal comparability of ESG indicators of different companies, which may lead to doubts about "greenwashing"; third, the institutional coordination dilemma cannot be ignored. The current global carbon market mutual recognition mechanism is still imperfect, and there are institutional frictions in the connection between the EU CBAM mechanism [18] and China's national carbon market, which may weaken the policy dividend transmission effect of blockchain empowerment. In addition, the path dependence characteristics of the governance structure of new energy enterprises are significant, and the traditional equity valuation model is difficult to fully reflect the synergistic value of technology patents and carbon assets. It is urgent to develop a valuation methodology that adapts to new production factors.

Future research can be deepened from three dimensions: first, using the multi-case comparison method [19] to analyze the differentiated application mode of blockchain technology in subdivided scenarios such as wind power, photovoltaic power, and energy storage; second, introducing dynamic capability theory to deconstruct how new energy companies can achieve the synergistic evolution of ESG capabilities and blockchain technology through organizational learning; finally, constructing a real option valuation model that includes environmental externality compensation to quantify the impact of carbon asset fluctuations on the valuation of new energy companies. These research directions will help to resolve the key bottlenecks in the operation of the mechanism and provide theoretical support for green financial innovation under the dual carbon goals.

5. Conclusion

This paper systematically reviews the existing literature and deeply explores the impact mechanism and valuation path of blockchain technology enabled ESG investment on new energy companies. The study found that blockchain technology has shown significant advantages in improving the transparency of ESG data, reducing management costs and optimizing the decision-making process, providing technical support for ESG investment in new energy companies. ESG investment has a positive impact on the valuation of new energy companies through risk mitigation, brand premium and policy dividends, and forms a synergistic effect through multi-dimensional paths. The theoretical contribution of this paper lies in the construction of a systematic analysis framework of "dual carbon goals → blockchain technology → ESG investment → new energy enterprise valuation", which provides a theoretical basis for subsequent research. At the practical level, this paper suggests that new energy companies should accelerate the construction of an ESG management system adapted to blockchain technology to enhance their sustainable competitive

DOI: 10.54254/2754-1169/2025.LD24977

advantage; while policymakers need to improve the ESG information disclosure standards in the blockchain environment to ensure the security and comparability of data.

Despite this, this paper also recognizes the shortcomings in the research. First, there isn't much detailed research yet on how blockchain technology and ESG investment work together and their measurable effects; Second, there hasn't been enough study on how this applies to different new energy industries and various types of blockchain technology (like public chains and alliance chains). Future research can further explore the dynamic evolution of blockchain technology in new energy ESG applications, as well as the differentiated impact of different technology choices on corporate value creation. In addition, based on the theory of dynamic capabilities, exploring how new energy companies can maximize the potential of blockchain-enabled ESG investment through organizational learning and capability building will also be a promising research direction.

Acknowledgement

The author sincerely thanks academic mentors for their support, encouragement, and academic guidance. As an incoming student at University College Dublin, the opportunity to explore this research topic has been a key motivation for future academic endeavors, laying a solid foundation for upcoming studies.

References

[1] Zhang, Q. & Wang, W. J.(2025). Carbon Emissions Trading Policies, Green Low-Carbon Transition and Enterprise Performance. Journal of University of Electronic Science and Technology of China (SOCIAL SCIENCES EDITION).

[2] Cao, J. W. & Zhu, Z. N. (2025). The Influence Mechanism of ESG Performance on Corporate Performance from the Perspective of Analyst Coverage—A Case Study of A-Share Listed Manufacturing Enterprises. Frontiers of International Accounting, 14, 145.

[3] Duan, A. H. (2024). Research on the Impact of ESG Performance of Listed Companies on Enterprise Value. E-Commerce Letters, 13, 7747.https: //doi.org/10.12677/ecl.2024.133952.

[4] Yu, Z. Z. & Zhang, X. Z. (2025). Research on the Impact of Corporate ESG Performance on Export Resilience. Statistics and Application, 14, 92.https: //doi.org/10.12677/sa.2025.144092.

[5] Zhang, H. Y., Hang, X. D., Zhang, D. & Zhang, X. L. (2021). Evaluating Economic and Social Benefits of Accelerated Energy Transition. Bulletin of the Chinese Academy of Sciences, 36(9), 1039-1048.

[6] Qu, Z. N., Shi, D., & Yang, D. H. (2022). Carbon Emissions of China's Digital Economy: Total Amount Calculation and Trend Prospects. China Population, Resources and Environment, 32(9), 11-21.

[7] Yan, J. & Xu, Q. (2025). Research on the Value Assessment of New Energy Vehicle Enterprises Based on FCFF Model and Catastrophe Progression Method. Modern Management, 15, 7.

[8] Yang, D., Zhao, L., Leng, F., & Shi, Z. (2025). Design of knowledge transaction protection mechanism in the open innovation community based on blockchain technology. Data Science and Management, 8(1), 86-93.

[9] Jang, H., & Ryu, D. H. (2025). Development of a service blueprint for blockchain services. PloS one, 20(1), e0317449.

[10] Wang, L., Miao, C. G., Han, X. L., Chen, J. J., Hou, P., & Zhao, H. F. (2024). Key Technologies and Applications of New Energy Site Selection Based on GIS + BIM. Bulletin of Surveying and Mapping, (10), 168.

[11] Liu, Y. J. (2022). On the Conflict and Coordination between ESG Investment and Fiduciary Duty. Journal of Financial Law, 5, 162-178.

[12] Xu, T. (2025). The research on value evaluation methods and application of enterprise data assets. E - Commerce Letters, 14, 959.

[13] Che, J. L. & Zuo, J. J. (2025). The Impact of Dynamic Equity Incentives on Green Technology Innovation in Enterprises. Operations Research and Fuzziology, 15, 321.

[14] Qiu, M. Y., & Yin, H. (2019). Enterprise ESG performance and financing costs under the background of ecological civilization construction [J]. The Journal of Quantitative & Technical Economics, (3): 108-123.

DOI: 10.54254/2754-1169/2025.LD24977

[15] Gao, J. Y., Chu, D. X., Lian, Y. H., & Zheng, J. (2021). Can ESG performance improve enterprise investment efficiency? Securities Market Herald, (11), 24 - 34.
[16] Sun, Y., & Song, S. (2024). Can Corporate ESG Performance Improve Financial Flexibility? Dongfang Forum—Journal of Qingdao University (Social Sciences Edition), (3).
[17] Liu, Y. (2025). Analysis of the current situation of construction project management and exploration of control strategies. Engineering Construction, 8(4), 28 - 30.
[18] Zeng, A., Tan, X. C., Wang, Y., & Gao, J. X. (2022). Impact and countermeasure analysis of the EU carbon border adjustment mechanism on China under the background of carbon neutrality. Chinese Journal of Environmental Management, 14(1), 31 - 37.
[19] Wei, W., & Zhao, X. (2021). Business models of different types of maker spaces from the perspective of the canvas: A multi - case comparison study. Science & Technology Progress and Policy, 38(9), 1 - 8.