Available Online: 20 April 2026 DOI: 10.54254/2977-3903/2026.32822

To what extent has artificial intelligence influenced the development of China's new energy industry

Weichen Xu

Suzhou Sucheng Foreign Language School, Suzhou, China

xuyi_ph@126.com

Abstract. With the benefits of AI technologies such as deep learning and big data simulation, AI has showedsignificant effects across different fields. New energy is an important pillar for China's development. And making research on the role of AI technology in the new energy industry highly closely and practical. By reading literature and analyzing data. This study finds that AI technology has positively influenced different aspects of new energy industry, including reducing production costs and improving industrial planning. However, AI also brings challenges, such as creating technical barriers, increasing capital costs, and may leading to monopolistic issues. There questions could hurt the growth of smaller companies. Overall, the benefits of AI technology for the development of the new energy industry important than drawbacks.

Keywords: AI technology, new energy industry, industrial influence, technology application

1. Introduction

Driven by both the change of global energy and digital transformation, AI, as a new quality productive forces, possesses big ability in data analysis, prediction, and improving, as a "main force" in advancing the new wave of scientific and technological revolution and industrial revolution years, the rapid development of new energy industries—primarily focused on new power systems, photovoltaics, hydrogen energy, and more—has become a key pillar in addressing global climate change, ensuring national energy security, and achieving the "dual carbon" goals. As one of the world's largest energy consumers, China faces risks to energy security due to high external energy dependency and challenges to sustainable economic development. Therefore, clarifying the pathways for the synergistic development of AI and new energy and deeply integrating AI with the new energy industry can inject strong momentum into high-quality economic development.

The "Implementation Recommendations on Promoting the High-Quality Development of "AI+" in the New Energy Sector" issued by the National Development and Reform Commission and the National Energy Administration projects that by 2027, China will preliminarily establish a new integrated system for energy and AI. By 2030, the specialized technologies and applications of AI in the new energy field are expected to achieve world-leading standards overall, with further improvements in power coordination mechanisms and the establishment of a green, economical, safe, and efficient operational model. This demonstrates China's consistent commitment to promoting the deep integration of AI technology with the new energy industry, which represents a key future goal and trend in the new energy sector. However, in practical terms, the

development of AI and new energy in China still faces issues such as incomplete integration, high operational costs, immature energy storage technologies, land occupation, and environmental pollution. Additionally, external pressures and contradictions, such as trade barriers for China's new energy technology exports, pose challenges to the development of China's new energy technology. Despite these challenges, the integration of AI to advance new energy development remains a crucial trend for the future.

Therefore, the structure of this paper is as follows: First, in the literature review section, key concepts of AI and the new energy industry will be clearly defined, and relevant theoretical foundations supporting this research, such as technological innovation theory and technology diffusion theory, will be explored. Additionally, existing scholarly perspectives related to this study will be summarized. In the discussion section, the development history and technological characteristics of AI will be analyzed, followed by an in-depth SWOT analysis of China's new energy industry. This section will focus on the role of AI in China's new energy industry and existing challenges. Finally, the paper will discuss how to better leverage AI to enhance the new energy industry in the future.

2. Literature review

2.1. Concept definition

2.1.1. Artificial intelligence

Artificial intelligence is a foundational science based on computer science, integrating interdisciplinary research to simulate human intelligence through algorithms and systems in theory, methods, and applications [1]. The concept of AI was talked mouth Conference in 1956, marking its emergence as an independent scientific field. Today, AI models such as "ChatGPT" and "DeepSeek" mean the dawn of a new era in AI.

2.1.2. New energy industry

As traditional energy sources dwindle and environmental damage becomes increasingly evident, new energy has become a key trend in future energy development. The United Nations Conference on New and Renewable Energy Sources in 1981 defined new energy as energy developed and utilized based on new technologies and materials, modernizing the use of traditional renewable energy sources. New energy refers to energy sources that are either newly developed, under active research, or awaiting widespread adoption, such as solar, geothermal, wind, marine, biomass, and nuclear fusion energy [2]. The new energy industry encompasses the processes and activities undertaken by organizations and enterprises involved in developing and applying new energy sources, primarily stemming from the discovery and utilization of these energies.

2.2. Relevant theoretical foundations

2.2.1. Technological innovation theory

Technological innovation theory was first systematically proposed by Joseph A. Schumpeter in "The Theory of Economic Development." "Innovation" refers to the establishment of a new production function—the setting up of a new product in function—which involves combining production factors and conditions in a novel way and introducing them into the production system.

The integration of new energy technology and AI represents an unprecedented new combination, where technological innovation can rejuvenate the new energy sector. Currently, the immaturity of the new energy industry is mainly due to incomplete technologies and low efficiency, and the development of AI can precisely address these shortcomings.

2.2.2. Technology diffusion theory

Technology diffusion refers to the phenomenon where technology, whether exclusive to a country, organization, or individual, is disseminated to others through paid or unpaid, public or confidential means. Technology diffusion can also be understood as encompassing technology trade, technology transfer, technology exchange, and technology dissemination. However, not all technologies are diffused; some are prohibited from dissemination. For example, according to international norms, technologies for manufacturing weapons of mass destruction are banned from diffusion. To ensure security or maintain a leading position in certain fields, a country may also prohibit the diffusion of specific advanced technologies for a certain period.

The continuous breakthroughs in AI technology enable it to assist other industries in various domains. AI has achieved significant breakthroughs in specific fields, such as new energy vehicles and new energy power stations. However, there are overarching issues such as a lack of leadership and challenges in data integration within the sector. Artificial intelligence can drive the development of the new energy industry through technology diffusion, while also promoting cross-industry technological innovation and industrial integration in the field of new energy, thereby bringing unprecedented opportunities to the industry.

2.2.3. Theory of economies of scale

The theory of economies of scale is a fundamental concept in economics. It refers to the phenomenon where enterprises reduce average costs and increase profit levels by expanding production scale [2]. Its mean increased output spreads fixed costs. When marginal cost equals average cost, the cost will be the lowest.

The continuous expansion of new energy business leads them to lower average costs and improve profit levels. AL can enhance this advantage. China's new energy technologies are often concentrated on specific applications or factor, lacking a systematic classification of the overall development and trends. This prevents Chinese businesses from increasing production and reducing production costs in specific aspects of new energy technology. AI can effectively integrate these resources, making new energy businesses to expand cost reductions and increase profits.

2.2.4. Industrial upgrading theory

Industrial upgrading is a systematic process of about production factors, adjusting industrial structure, and increase efficiency and quality to achieve higher product value-added and improve industry chain. At the micro point, it means as technological, manage, and product upgrades within enterprises. At the middle level, it is reflected in the increase of average value-added across industries. At the macro level, it points to the transformation of economic growth patterns towards knowledge-intensive models and the cultivation of new business forms, with technological progress as the important driver. The main factor implementation way include informatization transformation, technological innovation, organizational change, and institutional reform [3].

Artificial intelligence leverages its high intelligence and efficiency to help new energy enterprises improve efficiency, achieve increased industrial value-added, optimize industrial chains, and other systematic processes. At the micro level, it aids industries in enhancing efficiency. Driven by technology, it promotes industrial transformation and upgrading, improving the development quality of the industry [4].

2.3. Scholars' perspectives

2.3.1. Research on artificial intelligence

With the advancement of modern information technology, the development and application of artificial intelligence technology have garnered worldwide attention and importance. Its intelligent characteristics make computer technology more humanized and specialized. It can simulate human thinking patterns to process information and intelligently store and manage these information processing procedures [5]. Simultaneously,

artificial intelligence possesses powerful capabilities in data processing, autonomous learning, and decision-making optimization [6]. Artificial intelligence is implemented based on the application of computer technology. Through the proliferation of information facilities and the use of intelligent control and recognition systems, it can effectively achieve human-like control of computers, enhance software's self-identification capabilities, and improve work efficiency. It represents a mainstream trend for future development [5]. Driven by both the global energy transition and digital transformation, artificial intelligence, as a representative of new quality productive forces, possesses powerful capabilities in data analysis, prediction, and optimization, serving as a "main force" in advancing the new wave of scientific and technological revolution and industrial transformation.

As a new digital and intelligent technology, artificial intelligence is a major strategy for enhancing national economic and industrial core competitiveness. It is widely applied in numerous areas and warrants further exploration of its impact on the high-quality development of enterprises [7]. Artificial intelligence technology can help enterprises achieve intelligent and automated upgrades of production processes [8]. Existing studies often lack a comprehensive and systematic analytical framework when evaluating the contribution of AI technology to enterprise performance, failing to fully consider the combined effects of multidimensional factors such as enterprise costs and intense market competition [9].

2.3.2. Research on artificial intelligence and the new energy industry

2.3.2.1. The role of artificial intelligence in new energy

Artificial intelligence and new energy are two major waves in contemporary economic and social development. Wang and Zhang state that AI technology promotes cross-industry technological innovation and industrial integration in the new energy field, bringing new development opportunities to the energy industry [10]. They believe that in-depth analysis and research on the application and development prospects of AI technology in the new energy industry hold profound significance for the sustainable development of China's new energy sector. AI algorithms such as deep learning, which evolved from shallow artificial neural networks, have further improved the prediction accuracy of new energy, enhanced the collaborative optimization of new energy, and optimized energy storage scheduling [11].

From the perspective of market applications, AI technology can achieve intelligent monitoring, control, and management of new energy equipment, improve energy utilization efficiency, reduce operational costs, and promote the sustainable development of the new energy industry [11, 12].

2.3.2.2. Specific applications of AI in the new energy industry

As one of the world's largest energy consumers, China faces risks to energy security due to high external energy dependency and challenges to sustainable economic development [11]. The growth of China's new energy vehicle sector has already reached an accelerated level and has also moved into the phase of mass development [7]. The primary driving forces behind this rapid growth of this industry are ongoing improvements in technology and increasing applications as the result of such improvements [11].

As a result of government support, new energy vehicles in China have developed rapidly. The introduction of intelligent technologies (based on artificial intelligence) will have a significant impact on the competitive market environment of the new energy vehicle industry [13]. In addition to achieving reductions in CO2 emissions and energy savings via the use of electric vehicles, new energy vehicle manufacturers are also enhancing vehicle fuel efficiency through automation and artificial intelligence and improving the logistics for operating those vehicles. The development of these technologies together will allow for further growth of the new energy vehicle industry toward creating vehicles that are more environmentally-friendly, efficient, intelligent, and sustainable [14]. About the Increasing demand for New Energy, and need for innovation and improving in meteorological forecasting.

Facing the background of the demand for new energy increasing, traditional weather meteorological forecast mode urgently need to be innovated and upgraded, to boost the prediction results of each precipitation to the greatest extent, so as to keep the use of new energy power generation system stable and reliable. Artificial intelligence technology has unique channels and pathways to update and optimize the meteorological forecast methodologies [10].

2.3.2.3. Issues in the application of artificial intelligence in the development of the new energy industry

Artificial intelligence has gradually become an engine of the development of China's new energy vehicle industry, the technological advantage and strategic competitive resources of the new energy vehicle industry is constantly shifting to AI-driven intelligentization. For new energy vehicle enterprises, the high operation cost is an important factor restricting the development of new energy vehicle enterprises, and AI technology can provide a viable means for cost control [8]. AI applications enhance the total factor productivity of new energy vehicle enterprises through enhancing motivation for upgrading research and development capabilities and optimizing the structure of labor, enhancing productivity [14]. How to put forward relevant strategies for new energy vehicle enterprises to realize the intelligent development assisted by practical conditions have become an urgent issue for practitioners, so that the realization of sustained economic growth of the enterprise, at the same time given an enlightenment and reference for similar companies [14].

While AI technology is being applied to China's new energy industries—including vehicles, power generation, etc.—its use and development in these industries is still relatively superficial and undeveloped. There has not been a full realization or capitalization on the benefits of AI, resulting in lower production quality and lower efficiency. In addition, this has created a difficulty in adapting to the rapid and complex changes occurring in the market environment [10]. Accordingly, to create a significant amount of economic growth and momentum towards higher-quality economic development, it is essential to establish the guiding principles for synergistic AI/new energy development, create deep and sustainable synergy between the fields of AI and new energy, create collaborative partnerships between AI and new energy businesses, as well as establish a mutually beneficial industrial ecosystem [15].

However, there are several challenges associated with the implementation of AI in the new energy industry that will need to be overcome, including a lack of data integration, the high cost of technology implementation, as well as a shortage of trained and experienced individuals within the field of AI [11]. The use of AI in new energy is expanding quickly in terms of research and development, with a wide variety of potential application scenarios and major areas of focus. However, much of the existing body of research and literature focuses on specific applications or sectors of the new energy industry, leaving a significant gap in terms of the overall developmental framework for this sector, as well as the overall trends associated with AI and new energy. In addition, based on the experience of several new energy companies, it appears that the current implementation of AI technology is suffering from serious problems with respect to the standardization of processes and inadequate regulation or direction, which are restricting and slowing down innovation and development within the industry [10].

3. Discussion

3.1. The development history and technical characteristics of artificial intelligence

3.1.1. Development history

The term Artificial Intelligence (AI) came into being at the Dartmouth Conference in 1956. In 1958, the LISP programming language was developed and became a valuable tool for early AI researchers. For a common set

of problems, it lacked sufficient computing power for processing and adequate memory for storage, which render the problems unable to be addressed, and the result of limited funding, AI went through a period known as the "AI winter" from 1974 to 1980. The rediscovery of an effective learning algorithm called revitalized neural networks in 1986. The win of an AI computer over chess champion Garry Kasparov was considered a landmark victory for AI in rule-based work. In 2006 Hinton and colleagues introduced the ideas of deep learning, which enabled a new form of learning using large amounts of labeled data effectively in image and language processing using multi-level feature extraction and recognition. From that moment on, AI has entered an age of industrial-scale growth. Today, using big data model learnt from large amounts of raw observational data and from learning from trillions of user interactions, deep learning is able to recognize trends in any basically describable complex problem, even been able to propose and evaluate a solution, for example in scaling models like ChatGPT and 'DeepSeek'.

3.1.2. Technical characteristics

3.1.2.1. Autonomous learning and adaptive capability

AI improves its adaptability by using its ability to evaluate large amounts of data without human help to modify the way it works. For example, as autonomous vehicles become more common, they show how AI-covered vehicles can improve their performance and safety through ongoing learning about different driving conditions.

3.1.2.2. Efficient data processing capability

AI technology has the ability to analyze a large amount of information and provide decision makers with accurate and rapid analysis and classification by extracting, mining, transforming and categorizing data. One example of AI in the financial services industry is that AI can quickly analyze all transactions and provide recommendations to investors based on the analysis of those transactions.

3.1.2.3. Decision-making and autonomous planning capability

Systems that utilize Artificial Intelligence (AI) technologies can develop and create new solutions by building on their existing knowledge and information and through their own methods of reasoning and decision-making. AI systems in virtual gaming environments are an example of how AI can enhance the user experience and improve a user's chance of winning a game through the intelligent planning of their own independent actions, such as attack, defend, or avoidance of other players.

3.1.2.4. Cross-domain application capability

AI technology finds applications in various fields, such as speech recognition, image recognition, natural language processing, intelligent interaction, autonomous driving, and healthcare. With continuous technological advancements, the application domains of AI are expected to expand further.

3.1.2.5. Human-computer interaction and natural language processing capability

AI systems can interact with humans more effectively through modalities such as speech recognition, audio recognition, and visual interaction. Additionally, AI systems possess natural language processing capabilities, enabling them to analyze natural language inputs, understand semantics, and facilitate smoother communication between humans and machines.

3.1.2.6. Automation and intelligence

Autonomous software/robots may work a little in our stead, performing tasks in an automated fashion that reduces the tediousness and tedium of our work. Such systems may perform quality inspection, say in industrial production, or be responsible for assembly, and so forth.

3.1.2.7. Confidentiality and security

AI systems should protect the safety of sensitive information, and when creating or building AI systems, careful consideration should be given to any potential ethical issues, as well as security threats.

3.2. SWOT analysis of the current development status of China's new energy industry

3.2.1. Strengths

China's new energy industry is favorable for comprehensive policy support, rich technology accumulation and industrial chain. Policy support is an important advantage for the development of China's new energy vehicle industry.

The government has set new energy as a desired industry/upgrading through writing into the law system and policies, while encouraging its development. In addition, purchase of new energy vehicles is greatly subsidized, which vigorously supports the promotion and popularization of new energy vehicles.

The government has also drawn a series of plans and guidelines to improve the technical guidance and management of new energy vehicle industry with a view to prompting healthy development.

Technological accumulation is another crucial advantage for China's new energy industry. Firstly, China has established a standardized technological system in the field of new energy vehicles. Additionally, China possesses abundant lithium resources, ranking second globally. These rich mineral resources provide effective support for new energy development. Lastly, the completeness of China's new energy industrial chain is a key strength. Approximately 80% of products in critical steps of the industrial chain are domestically produced, and the industry has achieved cluster-based development, mainly concentrated in the Yangtze River Delta and Pearl River Delta regions. Central and western regions also boast extensive mineral resources, forming a clear division of labor nationwide.

3.2.2. Weaknesses

The newly emerging power generation industry in China is facing instability in power supply, pressure of operating power cost, immaturity of energy storage technology, occupation of land, pollution, etc. With respect to new energy source power generation like wind power, and light energy power generation, they are strongly affected by weather and natural environment so that they simply cannot supply power stably. Or in other words, it is simply impossible to supply continuously and stably demand power from them. The cost of building and operating new energy power plant projects is large and especially when investing in building these power generation plants in the first stage strong funding is required to purchase equipment as well as other things for research and development of equipment so that business operating cost quite increase

The energy storage problem is always restricting the development of new energy. The kinds of energy storage technology are still immature, and the cost is high and the energy density is low, making it impossible to reach the expectation of large scale energy storage. New energy projects need to occupy large land area for the installation of all kinds of equipment and collection of energies, seriously occupying the land resource. Because of building and using these kind of projects, the nature can also be influenced, for example The birds' migration can be disturbed by wind power and solar power stations, and the land might be occupied by photovoltaic power generation and used for other purposes.

3.2.3. Opportunities

Two unique opportunities for China's new energy industry are proactive government support and vast market demand. Regarding government support, the Chinese government has supported the development of new energy vehicles for years, and recent years have seen a series of policies to support the new energy industry with government subsidies and research funding. At the same time the government has issued strict emission

standards and limits on energy consumption for vehicles, urging automobile manufacturers to in-crease investment and application of new energy vehicle technology.

From the perspective of market demand, with the improvement of the public's awareness of environmental protection, more and more consumers realize that the current energy industry has caused tremendous harm to the environment, thus forming the demand for the new energy sector. China is the world's largest market, which provides a very broad market for the new energy industry. Government subsidies that reduce the price of new energy products are also an important factor affecting consumption.

3.2.4. Threats

China's new energy industry is faced with threats of an external environment being severe and complex, a continuous increase in demand pressure and more prominent constraint from contradiction. For example, countries and regions such as the United States and Europe, in order to win in new energy seize the initiative in the development competition, relying on technology and standards and policy crackdown on China new energy enterprises. It is necessary to further strengthen situation analysis, do a good job of unleashing potential, and promote the integrated development of domestic and international markets in order to create a good environment for development externally.

In the next period, China's energy consumption will still continue to grow rigidly and put continuous demand pressure on new energy development, and it is also difficult to complete the transformation of the traditional energy structure and speed up the pace of new energy as a safe and reliable traditional energy alternative. The new energy development is still facing insufficient land and other resource guarantees and insufficient grid connection capacity. The biggest contradiction between large-scale development of wind and solar power and shortage of land and sea space is still prominent, and it is necessary to strengthen policy coordination and guarantees for resources.

3.3. Analysis of the role of artificial intelligence in China's new energy industry

3.3.1. Reducing production costs

From the perspective of market applications, artificial intelligence technology can achieve intelligent monitoring, control, and management of new energy equipment, thereby improving energy utilization efficiency, reducing operational costs, and promoting the sustainable development of the new energy industry [12]. For example, through AI-enabled operations and maintenance, the China Huaneng Group reduced annual costs by 3.8 billion yuan at its wind farms, extended the Mean Time Between Failures (MTBF) from 180 days to 310 days, and decreased power generation losses by 65%. The new energy power prediction system of the State Power Investment Corporation's Changsha Operation Center achieved an accuracy rate of over 90%, with fault identification accuracy exceeding 98.6%. The China Datang Corporation established a "Smart Brain for Wind Farms," enabling dynamic performance evaluation and predictive maintenance of wind turbines, with fault warning accuracy surpassing 90%. This demonstrates that artificial intelligence has a significant impact on reducing production costs in the new energy industry.

3.3.2. Improving industrial planning

The new energy industry has long faced the problem of incomplete industrial development planning and poor overall coordination. AI has a good capability of data retrieval and collation, which helps the quick collection of information, collating and extracting from which is helpful for finding commonalities and divergences, helping the new energy industry to make better development plans. The new energy supply chain is globalised and vulnerable to external shocks such as geopolitics, and trade policies can lead to trade disruptions, or energy supply shock and cost shock on its ecosystem in the next industry development cycle. AI can help companies analyse macroeconomic political trend to help businesses predict the future global market demand

for the new energy industry 3 to 5 years in advance, so that enterprises can make early adjustments to industrial direction adjust at that point in a manner, helping to provide warnings for industrial optimization in the future, so that artificial intelligence can help new energy enterprises refine their industrial planning.

3.3.3. Promoting industrial innovation and integration

In the new era of big data, artificial intelligence technology will bring new opportunities to the development of the new energy industry, especially in intelligent recognition, information analysis and data prediction for the research and development and application of new energy technology and the promotion of cross-industry innovation and industrial integration, etc. It will have an important impact on the sustainable development of China's new energy industry. It is well-known that artificial intelligence technology will provide unlimited possibilities and critical support for the future development of the new energy industry. For example, artificial intelligence enables cross-industry integration of the new energy industry by accurately transmitting power to designated while providing the "power" of efficient clean energy for various industries. In addition, artificial intelligence also helps the new energy industry to test high-performance materials, can shorten the new energy as well as relevant technology research and development cycle, but also for industrial integration has an important supporting role in promoting new energy industries.

3.3.4. Enhancing technical precision

New energy is highly dependent on the weather such as hydropower and wind power. The degree of improvement of prediction accuracy is the key to the reliable operation of new energy power generation system. AI technology provides channels and path-ways for updating the meteorological forecasting method. Southern Power Grid Corporation uses AI technology to conduct power flow calculation, intelligent fault diagnosis accomplish dispatch optimization.AI can analyze local topography and effect of future environmental changes with satellite sensing and geomorphological analysis more accurately, thus saving power loss error. AI acts also like a virtual meteorologist in new energy, acting to simulate extreme scenario in training new energy system to respond to special situations. By converting a number of uncertainties existed in new energy industry to predictable risk, artificial intelligence with its technology brings the industry from dependence on the weather ("waiting for the heaven to eat") to precise control. In summary, artificial intelligence thus improves the technical precision of the new energy industry, to a great extent, and helps to reduce the production costs.

3.4. Critical thinking: existing problems

The development of artificial intelligence has both advantages and disadvantages. While it gives the advancement of the new energy industry, it also brings small negative impacts.

3.4.1. Technological barriers and capital costs

Most advanced AI models are centralized within a handful of tier-1 companies of AIGC. Acquiring access to these models represents a technological wall, of which a large proportion of small and medium-sized new energy enterprises cannot climb over, and are thus forced to continue using the inefficient legacy technology. The high costs and resource invested in AIs due to how dependent they are on advanced technology, and capital are another unrivaled barrier to the industry.

3.4.2. Increased energy consumption and carbon emissions

Training AI models requires ever-increasing compute and power. For example, training large language models like GPT-3 or even more so GPT-4 requires thousands of high-end GPUs, running non-stop for weeks or months and the consumption of electricity that is comparable to that of a small city in a period over several years! One study puts it that the carbon emissions from training a single large AI model can be equal to five

cars' lifetime emissions. And the production of high-end hardware like AI chips uses vast amounts of water and rare metals, it has big carbon emissions and environmental footprints for their production and disposal anyway, so it raises the environmental damage a bit further.

3.4.3. Data security and privacy risks

Current developments in artificial intelligence also face challenges related to data storage security. Centralized, massive datasets become "high-value targets" for cyberattacks. Once a database is breached, it could lead to large-scale data leaks affecting millions or even billions of users. When answering questions, large language models may inadvertently "recite" and output personally identifiable information, trade secrets, or copyrighted content contained within their training data, posing significant privacy risks.

3.4.4. Loss of control and security threats

If we develop AGI or even Superintelligence that is "better" than humans at everything, we are left with the situation of not being able to understand why it thinks the way it thinks and cannot be able to predict (and therefore control) its actions. If it is not aligned and doesn't have humanity's best interests in mind (if any), the results will be catastrophic, hence why some experts liken it to the biggest threat to humanity ever (like the late Stephen Hawking and Elon Musk for instance).

3.5. Recommendations for better leveraging AI in the new energy industry

3.5.1. Improve regulations and legal frameworks at the governance level

Governments must be both proactive and systematic in anticipating AI regulations, writing them into binding safe-ty standards, audit standards and accountability frameworks. Now China has released the "Interim Measures for the Management of Generative Artificial Intelligence Services" and the EU the "Artificial Intelligence Act" two glimpses of what AI laws can be like and we of course suggest to build on the suggestions below to develop a hierarchical and management system of AI technology. Development license and safety assessment before intense Ais go on market (most crucially AGI, but intense AI generally.) We must do better to get a dynamically updated AI ethics and safety review system for ourselves that keep updating laws and regulations in conjunction with tech being released.

3.5.2. Enhance the AI talent development system

Integrate into medium- and long-term science and technology development strategies "AI talent cultivation goals", increase investment in "research funding" and build "special talent funds" for young scholars and interdisciplinary teams; in basic education, encourage students' computational thinking, logical thinking and AI cognition, and cultivate interest through integration and practice; in higher education, encourage interdisciplinary training mode of "AI + X", breaking barriers between universities and disciplines; build "interdisciplinary AI school" to cultivate talent with both Technology and industry background; strengthen industry-education-research cooperation by setting up "Corporate Mentorship and Internship Base" for talent to improve their practical ability and innovative awareness

3.5.3. Strengthen the AI technology risk assessment mechanism

A thorough risk assessment must be conducted for the complete Life Cycle of AI systems, including AI models and deployment/use procedures and processes associated with Data Usage or Model Training, and Synthetic Data Generation. Using Synthetic Data Generation minimizes the risk of Data Breaches, since the data is generated from non-actual persons and thus has no implications for Privacy. In order to enhance User Data Protection, it is critical to implement Privacy Enhancement technologies (e.g., Differential Privacy, Federated Learning) during the Data Sharing/Analysis phase. Additionally, the AI Security Standard and

Certification Process must be developed within the industry to support Third-Party Review and Evaluation of AI System Safety and Ethical Practices.

3.5.4. Build a collaborative governance and standardization system

The new energy sector needs to work with the government, educational establishments, and other sectors to develop shared approach for documentation standards, guidelines, and processes for application of Artificial Intelligence (AI) within the new energy sector that addresses data specifications, algorithm openness, and quality of performance / system reliability. Additionally, the new energy sector will need to implement safety mechanisms in the event that there is an Artificial Intelligence (AI) malfunction (failure) and establish an incident reporting mechanism to improve risk mitigation capabilities for safety related issues. It is also necessary to facilitate further input and involvement from the public, and/or all stakeholders in relation to the governance and oversight of the Artificial Intelligence (AI) system by providing public hearings, white papers, and social impact assessments to increase transparency. At the same time, the People's Republic of China (PRC) should take a more active role in contributing to international forums regarding the establishment of fair and inclusive AI governance regulations to support and promote the implementation of GREEN & INTELLIGENT transformation for new energy industry and technology throughout the globe.

4. Conclusion

Based on a comprehensive review and analysis of the literature on Artificial Intelligence (AI) in the new energy sector, the following conclusions can be drawn:

When you combine the advancement of clean energy initiatives and the increasing utilization of Artificial Intelligence (AI) technologies within today's world, it is easy to recognize that the possibilities for AI lies in finding the best possible ways to use machine learning and other techniques to optimize performance, reduce operating expenses, provide faster service, and create better products at lower prices, companies can realize many benefits. Additionally, AI drives the transformation of industries from traditional industrial models to modern intelligent manufacturers. This transformation process provides technological support for building an ecological civilization, which is central to China's national goal of developing a sustainable socio-economic development model that works for everyone.

The advanced technologies of artificial intelligence are so highly specialised and have such a high barrier to entry that they may prevent many SMEs from applying these advanced applications. As a result, this could result in a few monopolies and an excessive concentration of market share. Moreover, if Those with the capability of developing AI systems do not have strong mitigation measures in place, there could be a greater potential for the use of AI systems to have increased energy consumption and carbon emissions which could result in a greater impact on our environment which would be contrary to the goals of a thriving, sustainable green economy represented by the renewable energy industry.

However, beyond these issues, artificial intelligence carries significant potential risks in the long run in terms of loss of control as it develops over time and the longer the technology continues to develop there will likely be greater challenges regarding constraints on how AI will be applied over time.

Finally, this study aims to provide theoretical references and guidance for the future application of AI technologies. Both the AI and new energy sectors should focus on technological advancement and talent development, lowering the threshold for high-precision AI technologies, and strengthening the connection between the two fields, thereby continuously supporting the sustainable development of China's new energy sector. For future developers, I hope they can harness the unique features of artificial intelligence and apply them to the new energy sector. Advanced algorithms can monitor equipment failures and health management

in renewable energy systems, while drone inspections enable analysis of energy output. However, they must also recognize that AI will bring challenges to the industry, such as more complex scenarios requiring developers to consider its environmental and sector-specific impacts. These represent both opportunities and challenges in the new energy industry.

Finally, I want future researchers to investigate any additional topics that I was unable to address in this research. Researchers may wish to explore how China's new energy industry differs from similar sectors operated by other countries, as well as what legal differences exist between China's new energy industry and all other countries' new energy industries, or what each country's new energy industries have regarding their influence on one another through technology transfer, investment, trade relationships, etc. In addition to these areas, I will analyze ways in which China may improve the efficiency and completeness of its efforts to develop its new energy sectors further.

References

[1] Office of the Central Cyberspace Affairs Commission. (2017, February 21). *Artificial intelligence: The greatest invention. Baidu Baike*. Retrieved May 5, 2025, from https: //baike.baidu.com/reference/9180/533aYdO6cr3_z3kATKaLz_nxNC7EMImovrTUW-ZzzqIPmGapB5nyTcYx4dRx-fhxWgjF_8oyMYFYxrrlCEpavZgRcO81RrwrnXL3TWuGlA

[2] Zhang, L. (2013). *Research on the cultivation of engineering and technological talents based on industrial innovation* (pp. 276–277). Zhejiang University Press.

[3] Chen, S. (2016, November 21). Symmetric economics glossary (Part 18). *China Reform Forum Network*. Retrieved November 26, 2016.

[4] Huang, X., Hu, Y., & Dong, Z. (2025). Theoretical mechanisms, risks and challenges, and enhancement paths of generative artificial intelligence empowering industrial transformation and upgrading. *Southwest Finance*, (10), 3–15.

[5] Wang, Y. (2021). The development and application of artificial intelligence and the new energy industry in China. *Business Observation*, (24), 51–53.

[6] Cui, Y., Shang, C., & Chen, S. (2019). A review of artificial intelligence: The development of AI. *Radio Communications Technology, 45*(3), 225–231.

[7] Qin, M., & Hu, C. (2025). Research on high-quality development of the new energy vehicle industry empowered by artificial intelligence: Based on the perspective of enterprise total factor productivity. *Journal of Luohe Vocational Technology College, 24*(3), 52–55.

[8] Zhang, B., & Song, C. (2024). The impact of digital transformation on technological progress in new energy vehicle industry chain enterprises. *Journal of Hebei University of Economics and Business, 45*(5), 73–87. https: //doi.org/10.14178/j.cnki.issn1007-2101.20240910.001

[9] Lu, H. (2024). The impact of artificial intelligence on retail enterprise performance: An empirical analysis based on data from A-share listed companies. *Journal of Commercial Economics*, (20), 147–150.

[10] Wang, C., & Zhang, N. (2025). The application and development prospects of artificial intelligence technology in the new energy sector. *Wireless Internet Technology, 22*(7), 40–43, 51.

[11] Wu, X., Liu, Y., Rebikul Bake, & Liu, H. (2025). Research progress and trends in the application of artificial intelligence in China’s new energy sector: A knowledge graph analysis based on CiteSpace. *Technology Entrepreneurship Monthly, 38*(3), 105–111.

[12] Ren, M., & Shu, X. (2024). Application and prospects of artificial intelligence in China’s new energy sector. *Energy Storage Science and Technology, 13*(10), 3619–3621. https: //doi.org/10.19799/j.cnki.2095-4239.2024.0818

[13] Liao, Y., Zhang, Y., Wang, H., Yang, L., Wu, J., Jing, Y., & Luo, Y. (2023). A review of artificial intelligence technology applications in intelligent connected new energy vehicles. *Journal of Chongqing University of Technology (Natural Science), 37*(7), 1–15.

[14] Yu, S. (2025). Development strategies for new energy vehicle enterprises in the context of artificial intelligence. *China Commerce*, (1), 154–156.

[15] Fu, Z. (2025, May 15). Research on the pathways for the collaborative development of artificial intelligence and the new energy industry. *Songyuan Daily,* p. 4. https: //doi.org/10.49053/n.cnki.nsorb.2025.000184