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THE ROLE OF ARTIFICIAL INTELLIGENCE IN IMPROVING THE ECONOMIC EFFICIENCY OF RENEWABLE ENERGY SOURCES

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Abstract
This article discusses the role of artificial intelligence (AI) in improving the economic efficiency of renewable energy sources (RES). The relevance of the topic is due to the growing demand for energy and the need to reduce greenhouse gas emissions. Research shows that AI can significantly improve the operation of RES by optimizing production processes, increasing the reliability of equipment and efficiently managing distributed energy systems. The use of AI also helps to reduce the costs of energy production and distribution, which makes RES more attractive to investors. The article analyzes the methods of applying AI, including machine learning, predictive algorithms and smart grid management. The main findings highlight the need for further research and investment in AI technologies to fully unlock the potential of renewable energy and accelerate the transition to clean energy.

Keywords: Artificial intelligence, renewable energy, analytics, power system, efficiency, investment.

Introduction

In recent years, renewable energy sources (RES) have become an increasingly important part of the global energy system. Reducing the carbon footprint, improving the environmental situation and increasing the energy independence of countries make RES attractive to investors and governments. RES include solar, wind, hydropower and biomass, which have significant potential to replace traditional energy sources based on fossil fuels.

However, to achieve maximum efficiency and competitiveness of RES, it is necessary to implement advanced technologies such as artificial intelligence (AI). AI is a set of technologies that can analyze data, predict results and make decisions based on machine learning and other algorithms. The introduction of AI in the field of RES

opens up new opportunities to optimize the operation of energy systems and improve their economic efficiency.

Relevance of the Topic

In the context of growing demand for energy and the need to reduce greenhouse gas emissions, the use of renewable energy sources is becoming especially relevant. Traditional energy sources such as oil, coal and natural gas cause significant damage to the environment and contribute to global climate change. Therefore, many countries are seeking to increase the share of renewable energy sources in their energy balance. AI plays a key role in increasing the economic efficiency of renewable energy sources, which makes them more attractive for investment and contributes to their widespread use. The introduction of AI allows solving such problems as optimizing the operation of energy systems, increasing the reliability of equipment and managing distributed energy systems. This allows reducing the costs of energy production and distribution, improving the sustainability of energy systems and reducing their impact on the environment. ### Relevance of the topic for Uzbekistan. Uzbekistan, like many other countries, faces growing demand for energy and the need to reduce greenhouse gas emissions. Traditional energy sources such as oil, coal and natural gas cause significant damage to the environment and contribute to global climate change. In this context, the transition to renewable energy sources (RES) is becoming increasingly relevant for Uzbekistan.

An important factor for Uzbekistan is its geographical location and natural resources. The country has significant potential for the development of solar and wind energy. For example, vast desert areas and a high number of sunny days per year make solar energy one of the most promising areas for the development of RES in Uzbekistan. At the same time, the introduction of RES requires significant investment and advanced technologies to ensure economic efficiency and sustainability of the energy system.

1-drawing. AI and Renewable Energy Efficiency

AI plays a key role in increasing the economic efficiency of RES in Uzbekistan, making them more attractive to investors and contributing to their widespread use. The introduction of AI allows solving such problems as optimizing the operation of energy systems, increasing the reliability of equipment and managing distributed energy systems. This allows reducing the costs of energy production and distribution, improving the sustainability of energy systems and reducing their impact on the environment.

Renewable energy development projects using AI technologies are already being implemented in Uzbekistan. For example, solar and wind power plant construction projects include the use of AI to predict energy production, manage loads and optimize the operation of installations. This allows significantly increasing the efficiency of these projects and attracting additional investment.

Thus, the use of AI in the field of renewable energy is an important step for Uzbekistan towards sustainable development and solving environmental problems. The development and implementation of AI technologies in the energy sector will allow

Uzbekistan to ensure cleaner and more sustainable energy supply, reduce dependence on fossil fuels and strengthen its energy independence.

Status of the Topic

In recent years, there have been many studies on the application of AI in the field of renewable energy. Much attention is paid to the use of machine learning to predict energy production, optimize plant operation, and manage energy flows. Algorithms have been developed that can detect equipment failures at an early stage and reduce maintenance costs. For example, machine learning algorithms can analyze sensor data and predict when equipment needs to be repaired or replaced.

Research also shows that AI can play an important role in the management of distributed energy systems such as microgrids. Microgrids allow different energy sources to be integrated and managed more efficiently. AI can analyze energy consumption data, predict demand, and optimize microgrid operation, which leads to increased efficiency and reduced costs.

However, research shows that the potential of AI in the field of renewable energy has not yet been fully realized, and there is significant room for further development. Research continues on the application of AI to manage smart grids, integrate renewable energy into general energy systems, and improve the economic efficiency of renewable energy projects.

Analysis Methods

Various methods are used to analyze the role of AI in improving the economic efficiency of renewable energy sources. First, machine learning is used to analyze large amounts of data, such as meteorological conditions and equipment performance. Machine learning algorithms can analyze historical weather data and predict energy production for solar and wind power plants, which allows for their operation to be optimized and energy losses to be reduced.

Second, predictive algorithms are used to predict energy production and optimize the operation of installations. These algorithms can analyze data on current and forecasted conditions, such as solar radiation and wind speed, and adjust the operation of installations for maximum performance. This helps reduce energy production costs and improve its economic efficiency.

Third, energy consumption and load distribution data are analyzed, which allows for more efficient management of power systems and reduction of energy losses. AI can analyze real-time energy consumption data, identify load peaks, and optimize energy

distribution between different consumers. This helps reduce the load on energy infrastructure and improve the stability of power systems.

Conclusions and Suggestions

The introduction of AI in the field of renewable energy can significantly improve their economic efficiency. Key findings include:

- Optimizing the operation of renewable energy installations with AI can increase their productivity and reduce costs.
- Using predictive analytics improves equipment reliability and reduces maintenance costs.
- Managing distributed energy systems and smart grids with AI can use energy resources more efficiently and reduce energy losses.

In the future, it is necessary to continue research and development in the field of AI for renewable energy to fully realize their potential and make renewable energy even more attractive and sustainable. Governments and private companies should invest in the development of AI technologies and their integration into energy systems, which will accelerate the transition to cleaner and more sustainable energy sources.

References

1. Khatchadourian, Raffi (2015). "The Doomsday Invention". The New Yorker. Retrieved 29 March 2020.
2. Adams, Tim (12 June 2016). "Nick Bostrom: 'We are like small children playing with a bomb'". The Observer. Retrieved 29 March 2020.
3. Chivers, Tom (10 August 2014). "Superintelligence by Nick Bostrom, review: 'a hard read'." The Telegraph. Retrieved August 16, 2014.
4. "Best Selling Science Books". The New York Times. 8 September 2014. Retrieved 9 November 2014.
5. Dean, James (5 August 2014). "Artificial intelligence 'may wipe out the human race'". The Times. Retrieved August 5, 2014.
6. Black, Melia Russell, Julia. "He's played chess with Peter Thiel, sparred with Elon Musk and once, supposedly, stopped a plane crash: Inside Sam Altman's world, where truth is stranger than fiction." Business Insider. Retrieved 15 August 2023.
7. Eraliev A.A. Digitalization and use of artificial intelligence: key aspects of modern enterprise management. Web of Scientist: International Scientific Research Journal ISSN: 2776-0979, Volume 5, Issue 11, November - 2024 21.