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Artificial Intelligence (AI) in the Sustainable Energy Sector †

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Abstract: The power industry is at a point of intersection. Modern technical advances have the potential to drastically alter our electricity supply, trading, and usage. Artificial intelligence (AI) technologies are transforming the current modernization approach. Big data management, vast computational resources, telecommunications, enhanced machine learning, and deep learning techniques have all contributed to the rapid surge in AI technology. Smooth software that improves judgment and management will automatically adjust the merging of electricity supply, usage, and sustainable energy into the electricity network. Supercomputers, power systems, and communications networks between the command center and devices are all part of a smart electricity system. AI is expected to be crucial in attaining the abovementioned capabilities. This research assessed whether artificial intelligence algorithms surpass conventional methods in stability, massive data management, smart grid, energy-saving optimization, and planned maintenance management for renewables. Based on recent findings, it can be concluded that AI will play an essential part in the future energy industry. To obtain better results, the sustainable energy industry, companies, power network administrators, and independent generators of electricity should place more emphasis on AI technologies.

Keywords: artificial intelligence technologies; electricity supply; power system; renewables

1. Introduction

Artificial intelligence (AI) has transformed a growing number of industries. For example, AI is projected to have an immediate and long-term impact on international production, diversity and inclusion, ecological results, and a variety of other domains [1]. The possible repercussions of AI on environmental sustainability reveal the potential for equally beneficial and harmful consequences [2]. Big data management, vast computer power, telecommunications, enhanced machine learning (ML), and deep learning (DL) techniques have all contributed to the current surge in AI systems. In ref. [3], there are numerous prominent sectors wherein AI may have a significant impact, such as modeling, transmission, optimization, sustainability, as well as security. AI technological breakthroughs are reshaping the energy sector. Several nations have used AI systems to accomplish various jobs, such as the managing, predicting, and effective power operations of teams [4]. Prediction methods are frequently utilized in the prediction of coal, oil, and renewable energy generation, as well as load demand, including electricity prices, among other things [5]. Predictions aim to minimize ambiguity and provide standards for controlling the true results of electricity networks [6]. A new generation of AI has emerged along with the possibility to significantly improve estimation methods for areas like market growth, staff retention, working capital, transportation needs, staff forecasts, and inventories [7]. Cybercrimes have been investigated in light of the significant development in AI installation with the Internet of Things in the power industry, as well as micro-grid architecture management, and methods to avoid such assaults are rapidly expanding. Such assaults devastate infrastructures, raise unforeseen risks, and result in significant financial damage [8].

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There is a huge requirement for inexpensive, dependable, green, carbon-free power generation, and artificial intelligence (AI) is being employed to assist and fulfill this requirement. Several power systems are projected to incorporate AI. Within the power industry, potential AI issues are infrastructural deficiencies in the electricity system, inadequate hands-on experience, and a background that is not conceptual.

2. Possibilities for Further Investigation

AI is widely used in renewable energy studies for efficiency, planning, control, estimates, regulation, and transmission. AI algorithms for studies on renewable energy seem to be sophisticated and costly. Such approaches, in essence, must be simpler and more inexpensive. It is necessary to develop AI network services that can appropriately detect electricity effectiveness and funds for clients and companies in the coming years. Through dispersed power bases and dispersed generation, AI could be used to incorporate renewable electricity into the grid and enable considerable discretion. Because of the rapid advancement of numerical AI techniques and information analytics, approvals for novel items and facilities should be achieved as swiftly and inexpensively as possible. The information system must be clear and reachable wherever practicable.

3. Conclusions

Artificial intelligence (AI) is widely used in practically all renewables studies (like PV, winds, and combination) for planning, construction, administration, prediction, regulation, and transmission. It is necessary to develop AI software packages that can appropriately recognize electricity effectiveness and investments for individuals and trades in the coming years. The connection and optimization of renewables with electricity networks utilizing AI technology have the potential to improve flexibility, dependability, electricity constancy, profitability, burden scheduling, and so on. Organizations that undertake AI study and advancement and employ AI technology in the commercial and governmental power industries need certified AI professionals. AI has the potential to change numerous power industries and boost development in the next years.

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