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# Artificial Intelligence in Renewable Energy

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**Abstract:** In recent trend Renewable energy sources has become more attractive to provide electricity to rural and Isolated/remote areas. Renewable energy provides reliable and sustainable power where electricity extension is very difficult. With the implementation of Artificial Intelligence technology, it helps to improve accuracy of operation and provide effective and accurate prediction control of integrated system. By developing smart grids more data are collected by power system operators through advance sensing devices & smart metering. AI method deals with complex nonlinear problems without assumptions and simplifications.

Keywords: Renewable Energy Community Artificial Intelligence (AI), Optimisation, Visualisation.

## I. INTRODUCTION

As the world entered in 21st century with increasing population and development of the economy and society demand for energy of daily life and production is an inescapable. The use of fossil fuel has led to their acute depletion, which causes Global warming and climate change due to their high greenhouse gas emissions. Global warming could create serious problem such as sea level rising, increasing the temperature of earth, and ecologically damaging which would pose a threat to human society.

Renewable energy sources include Hydro, Wind, Solar, Biomass, Geothermal etc. It has evident advantageous compare to non-renewable energy. To improve the accuracy of renewable energy prediction is very important for power system. In recent year's computer technologies such as multimedia, AI have emerged. This lead to more active AI research and widened the field of research and application AI based technologies have been applied to solve issue related to integrating renewable energy with power system such as wind, solar forecasting.

#### **II. LITERATURE SURVEY**

- 1. In recent scenario electric power system is undergoing major changes, due to large-scale integration of renewable energy, complicated network structure and increased energy demand. An autonomous system, intelligent and digital communication technologies are very much popular to strengthen and stabilize the power grid. The recent technological developments in AI and hybrid techniques, makes it possible for solving large-scale complex power systems problems like control, planning, scheduling, prediction etc. By using AI technology, it becomes easy to handle constraints such as power system stability assessments, power system forecasting studies, power quality problems, and optimization of generation scheduling.
- 2. The main objective is to examine the state of the art of artificial intelligence (AI) techniques and tools in power management, maintenance, and control of renewable energy systems (RES). This would allow researchers to innovate the current state of technologies and use this standard and successful techniques in building AI-powered renewable energy.
- 3. In response with energy shortage crisis and global warming, cleaner power production with optimum and smart operation strategy is the most effective solutions. With the target for the carbon emission peak in 2030, and the carbon-neutrality in 2060 the most of develop countries like China, have install renewable systems, such as solar PVs and wind turbines, will become the most advanced carbon elimination strategies, in addition to carbon off-setting strategies. However, several critical technical challenges are imposed on renewable energy systems. The renewable energy systems will suffer from various faults, such as system errors such as utility loss, isolation failure, grid voltage failure, ground current failure and grid frequency failure.

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#### III. IMPORTANCE OF AI IN RENEWABLE ENERGY MANAGEMENT

As we are moving towards an electric world more energy will be produced by decentralised renewable sources. Micro grids, wind, farms private solar panels and batteries they are from a sustainability point of view there will add complexity to energy grids across the globe.

With help of AI software decentralised energy sources can send any excess electricity that produced to the grid, while utilizing direct power to where it's needed. Comparably, energy storage inn industrial facilities, office buildings, homes can hold excess energy when demand is low, while AI establish that power when generation is inadequate or impossible. Lots ofmoving parts require coordination, forecasting and optimization to keep the grid in balance. This means that utilities, policy makers and regulatory bodies necessitate to start thinking about what role they want to play when it comes to decentralised energy resources.

Investing in centralised grids with long wires and transformers is the wrong way instead of that government need to plan for a grid where communities and buildings generate their own electricity managed in real time by software. Policy makers should consider public financing of renewable energy generations and incentives for more distributed energy generation in home and private industry. So, we need to accept governance of AI software to ensure inoperability, transparency and access across energy landscape.

AI combined with Internet of Things (IoT) can help in optimize energy distribution and storage. IoT can help with remote controlling of systems, consumption tracking, data collection, and analysis whereas AI can help with decision making about where to supply energy, which generating capacity to activate or turn off the capacity of energy to store, and many other decisions.

Systems will be fitted with smart sensors and meters to capture information and exploit tons of cloud computing capacity as AI algorithms Process Mountains of data to make valuable decisions. Companies that are leading in technological development and implementation of AI in the energy sector include IBM Corporation, Intel Corp, Cisco Systems Inc., Mitsubishi Hitachi Power Systems Ltd, Microsoft Corp, and many others.



#### Emerging technologies in Renewable Energy sector

Fig. Convergence-AI is part of suit of technologies that will transform the renewable energy sector.

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- 1. Control and operation of demand response: Allowing large consumers pf electricity to be rewarded when decreasing their energy requirements on short notice in order to stabilize the grid, cost saving for grid operators.
- 2. Grid Resilience for a more resilient, flexible and decarbonized grid, embracing AI and machine learning technology is a must.
- 3. Artificial intelligence makes power generated from renewable sources more predictable and increases its value.

#### V. ADVANTAGE OF AI IN RENEWABLE ENERGY

- 1. One of the main advantages of AI for energy production is ability to increase efficiency by manipulating data from smart meters, weather forecast, and grid congestion information.
- 2. Speed of processing.
- 3. Ability to handle situations of incomplete data and information.
- 4. AI controls energy usage and reduced it specifically during peak hours, identifies signal problem and detect equipment failures before they occur.
- 5. It helps to monitor and interpret the data produce by energy industries to optimise energy consumption.
- 6. Speed of processing.
- 7. Ability to handle situations of incomplete data and information.
- 8. AI controls energy usage and reduced it specifically during peak hours, identifies signal problem and detect equipment failures before they occur.
- 9. It helps to monitor and interpret the data produce by energy industries to optimise energy consumption.

### VI. CONCLUSION

- 1. A significance of AI technology in renewable energy sector is the ability to collect real world data including energy demand patterns and historic weather so that organisations can make well informed decisions about future energy needs of society.
- 2. Socio –economic and sustainable development of remote areas is possible by implementing AI in renewable energy sector to meet energy demands. Data exchange from smart grids to consumers helping them to manage their supply and energy bills as well as inform the grid on upcoming demand to help optimise energy storage.
- **3.** The AI-related technologies are the most effective ways for solving issues related to integrating renewable energy with power systems. However, there are also some challenges and bottlenecks, and AI-related technologies and models will be continuously optimized in the future.

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