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Artificial Intelligence (AI) in Renewable Energy Market Forecasts to 2030 – Global Analysis By Source (Wind Energy, Hydropower, Solar Energy, Geothermal Energy, Bioenergy, and Other Sources), Deployment Mode, Technology, Application, End User and By Geography

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Abstracts

According to Stratistics MRC, the Global Artificial Intelligence (AI) in Renewable Energy Market is accounted for $940.50 million in 2024 and is expected to reach $3622.31 million by 2030 growing at a CAGR of 25.2% during the forecast period. Advanced algorithms, machine learning, and data analytics are used in renewable energy to maximize energy production, distribution, and consumption from renewable sources such as solar, wind, and hydro. AI enhances grid management, predicts energy demand, improves efficiency, and enables predictive maintenance of renewable energy infrastructure. By integrating AI, energy providers can minimize costs, reduce carbon emissions, and enhance reliability, making renewable energy more sustainable and scalable in the transition toward a cleaner global energy system.

Market Dynamics:

Driver:

Rising need for grid optimization

The increasing complexity of power systems and the integration of renewable energy sources necessitate advanced AI solutions for efficient grid management. AI can help in predicting energy demand, managing supply, and ensuring the stability of the grid. It

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can also optimize energy storage and distribution, reducing losses and improving efficiency. Moreover, AI can facilitate the integration of distributed energy resources like solar and wind, enhancing grid flexibility. As renewable energy adoption grows, so does the need for sophisticated grid optimization tools. Hence, AI is becoming indispensable in modern energy grids.

Restraint:

Energy consumption of AI models

The high computational power required for AI models can lead to significant energy consumption. This energy consumption can sometimes offset the efficiency gains achieved in renewable energy systems. Training large AI models requires substantial computational resources, which translates to increased energy use. Additionally, the continuous operation of AI systems for real-time data analysis and decision-making further adds to energy consumption. This poses a challenge for the sustainability of AI in the renewable energy sector. Balancing the benefits of AI with its energy footprint remains a critical concern.

Opportunity:

Increased investments in smart grids

Smart grids incorporate advanced sensors, communication networks, and AI algorithms to improve energy management. These investments aim to enhance grid reliability, reduce outages, and increase efficiency. AI plays a pivotal role in smart grids by enabling predictive maintenance, demand forecasting, and dynamic grid balancing. As governments and private sectors invest in smart grid infrastructure, the demand for AI-based solutions is set to rise. This presents a significant growth opportunity for AI in the renewable energy market.

Threat:

Data security and privacy concerns

The extensive data generated by AI applications in renewable energy raises concerns about data security and privacy. Unauthorized access to sensitive data can lead to significant security breaches and financial losses. Additionally, the integration of AI with grid infrastructure makes it a potential target for cyber-attacks. Ensuring robust cyber-

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security measures is crucial to protect against these threats. Compliance with data protection regulations further adds to the complexity of managing AI systems in renewable energy. Addressing these security challenges is vital for the widespread adoption of AI in this sector.

Covid-19 Impact

The pandemic has accelerated the adoption of digital technologies, including AI, in the renewable energy sector. AI has been leveraged for remote monitoring, predictive maintenance, and optimizing energy usage during lockdowns. The need for resilient and flexible energy systems has become more apparent, driving investments in AI solutions. However, the pandemic has also highlighted the vulnerability of energy infrastructure to disruptions. Ensuring the reliability and stability of energy systems during such crises is crucial.

The hydropower segment is expected to be the largest during the forecast period

The hydropower segment is expected to account for the largest market share during the forecast period, due to the established infrastructure and the potential for integrating AI to optimize operations and enhance efficiency. AI can improve water flow management, predict equipment failures, and optimize energy production. The ability to generate large amounts of renewable energy with minimal environmental impact makes hydropower an attractive option. Additionally, the integration of AI can further enhance the sustainability and reliability of hydropower systems.

The residential segment is expected to have the highest CAGR during the forecast period

Over the forecast period, the residential segment is predicted to witness the highest growth rate. AI-enabled energy management systems can optimize energy usage, reducing costs and enhancing convenience for homeowners. The rise of distributed renewable energy generation, such as rooftop solar, further drives the adoption of AI solutions in residential settings. Additionally, government incentives and subsidies for residential renewable energy systems contribute to this growth.

Region with largest share:

During the forecast period, Asia Pacific region is expected to hold the largest market share, due to significant investments in renewable energy infrastructure. Countries like

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China and India are leading the charge in renewable energy adoption, supported by government initiatives and favourable policies. The region's focus on sustainable development and reducing carbon emissions drives the demand for AI solutions in energy management. Additionally, the presence of major AI technology providers in the region further boosts market growth.

Region with highest CAGR:

Over the forecast period, the North America region is anticipated to exhibit the highest CAGR, owing to strong government support, technological advancements, and a robust market for renewable energy solutions. The United States and Canada are investing heavily in AI and renewable energy projects, driven by the need to reduce carbon emissions and enhance energy efficiency. Additionally, the presence of leading AI and renewable energy companies in North America contributes to this high growth rate.

Key players in the market

Some of the key players profiled in the Artificial Intelligence (AI) in Renewable Energy Market include Google, Microsoft, IBM, Siemens, General Electric (GE), Schneider Electric, ABB Ltd., Tesla, Enel Group, NextEra Energy, Shell AI, GridBeyond, Kayrros, Open Energi, Autogrid Systems, Verdigris Technologies, Innowatts, Uptake Technologies, Xcel Energy, and UrbanChain.

Key Developments:

In January 2025, General Electric (GE) America’s leading energy manufacturing company, is planning to invest nearly $600 million in its U.S. factories and facilities over the next two years to help meet the surging electricity demands around the world.

In July 2024, Siemens consortium partners with Bengaluru Metro Rail Corporation Limited for Rail Electrification technologies. Siemens Limited, as part of a consortium along with Rail Vikas Nigam Limited (RVNL), has secured an order from Bangalore Metro Rail Corporation Limited (BMRCL) for electrification of Bengaluru Metro Phase 2 project contributing to sustainable public transport in the city.

Sources Covered:

Wind Energy

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Hydropower

Solar Energy

Geothermal Energy

Bioenergy

Other Sources

Deployment Modes Covered:

On-Premises

Cloud-Based

Technologies Covered:

Machine Learning (ML)

Deep Learning

Natural Language Processing (NLP)

Computer Vision

Other Technologies

Applications Covered:

Energy Forecasting

Energy Storage Management

Grid Management & Optimization

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- Predictive Maintenance
- Demand Response Management
- Energy Trading
- Other Applications

End Users Covered:

- Utilities & Power Generation Companies
- Renewable Energy Companies
- Government & Public Sector
- Commercial & Industrial Sector
- Residential
- Other End Users

Regions Covered:

- North America
  - US
  - Canada
  - Mexico
- Europe
  - Germany
  - UK

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- Italy
- France
- Spain
- Rest of Europe

Asia Pacific

- Japan
- China
- India
- Australia
- New Zealand
- South Korea
- Rest of Asia Pacific

South America

- Argentina
- Brazil
- Chile
- Rest of South America

Middle East & Africa

- Saudi Arabia

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UAE

Qatar

South Africa

Rest of Middle East & Africa

What our report offers:
- Market share assessments for the regional and country-level segments
- Strategic recommendations for the new entrants
- Covers Market data for the years 2022, 2023, 2024, 2026, and 2030
- Market Trends (Drivers, Constraints, Opportunities, Threats, Challenges, Investment Opportunities, and recommendations)
- Strategic recommendations in key business segments based on the market estimations
- Competitive landscaping mapping the key common trends
- Company profiling with detailed strategies, financials, and recent developments
- Supply chain trends mapping the latest technological advancements

Free Customization Offerings:

All the customers of this report will be entitled to receive one of the following free customization options:

Company Profiling

Comprehensive profiling of additional market players (up to 3)

SWOT Analysis of key players (up to 3)

Regional Segmentation

Market estimations, Forecasts and CAGR of any prominent country as per the client's interest (Note: Depends on feasibility check)

Competitive Benchmarking

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Benchmarking of key players based on product portfolio, geographical presence, and strategic alliances

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Note: Tables for North America, Europe, APAC, South America, and Middle East & Africa Regions are also represented in the same manner as above.

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