The Role of IoT and Big Data in the Renewable Energy Sector.

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Renewable energy is gaining traction as fossil fuel reserves deplete at an alarming rate. Renewable energy is energy generated from natural sources that furnish or renew themselves without depleting the planet's resources. These green resources include sunlight, wind, rain, waves, tides, etc. Renewable energy can be said to be virtually limitless (Ponnalagarsamy et al., 2021).

As the globe becomes more aware of energy usage and production, the market share of renewable sources grows and many organizations and the energy industry at large seek better ways to manage the expanding infrastructure, facing new obstacles. However, the inconsistency complicates infrastructure operations and poses hurdles to consumers and energy companies. Therefore, the energy industry is embracing smart grid technologies to stabilize the supply of green energy and make renewables a reliable and future-proof resource (Infopulse, 2020).

Pratit, (2022), stated that the Internet of Things (IoT) and Big Data Analytics are two of the most notable technologies that are connected and can propel this journey forward. Solar and wind power, for example, require advanced control systems for high-performance and reliable operation. Implementing a smart grid as a network powered by digital technology, such as IoT, provides both the deploying company and the user with effective tools for monitoring and regulating the functioning of the electric grid by managing various devices at households and production sites.

According to Ponnalagarsamy et al., (2021), the use of IoT results in changes from generation to transmission to distribution. In the case of traditional exchanges, the power produced by the power station is transmitted to the end-user. The consumer is responsible for the cost of the energy consumed.

However, smart grids have two-way communication. The user can pay just for the energy utilized having gotten real data through the installed smart meter and if extra, electricity produced can be supplied to the grid (although this technology is yet to be introduced in underdeveloped countries such as Nigeria.) IoT assists in evaluating demand, and energy waste, and in scheduling loads to save costs. Sensors and data sciences combined with IOT aid in the automation and intelligent operation of renewable energy plants, increasing the plants' efficiency and reliability in meeting our future energy demand (Ponnalagarsamy et al., 2021).

The introduction of smart devices in transmitting power generated for consumers has reduced the cost and stress of traveling to the site for repairs and maintenance. Using big data and IoT, the deploying organization can troubleshoot and deploy solutions even at odd hours straight from the smartphones' applications connected to the device at the site.

Furthermore, in addition to real-time performance monitoring and control, the data collected provides important insights and data-driven decisions. Data can be collected on consumption, power quality, self-diagnostics, smart meters, and device operational statuses. Thanks to edge computing and 5G adoption, Energy companies can gain a comprehensive insight into their consumer behavior, use data-driven automation to pinpoint distribution system flaws, check performance capabilities, and improve smart grid optimization and consumer service through data analytics (Infopulse, 2020).

The energy market is presently going through strategic reforms. These developments are concentrated on decarbonization, energy efficiency, the development of new digital energy market models, as well as the adoption of IoT and big data technologies. Due to the benefits described above, investor interest in IoT, Big Data, and Artificial Intelligence (AI) is significant. The IoT energy sector is predicted to be valued at $35.2 billion globally by 2025, up from a value of $20.2 billion in 2020 hence, the potential for IoT applications in the energy sector is very promising (Shkuropat, 2022).

Although the use of IoT and Big Data in renewable energy generation has numerous advantages, it is not without challenges and obstacles. Some of the challenges according to Joshi, (2019), include:

1. The upfront investment expense. Despite major price reductions in recent years, the equipment for harvesting renewable energy remains expensive.

2. Using IoT devices makes them open to hackers. Because the devices are linked to a network, a cyberattack is possible if the network is not properly secured. This can result in unsafe and unpleasant situations for the organization, its users, and the industry. To prevent any future grid assault, a secure system must be implemented (Joshi, 2019).

Most organization is still limited in the provision of backend support against cyberattack. A good investment in IoT anti-cyber-attack software will give them a good edge.

Finally, renewable energy sources are the future of electricity generation. Many businesses and governments according to Joshi, (2019), are already investing in smart cities around the world, and these smart cities will be powered by smart energy technologies. Providing clean energy to these smart cities is a key factor, and the use of IoT in renewable energy production will play a significant part in enhancing the dynamics of a clean energy source.

Renewable energy will grow smarter, more efficient, and more reliable in the future. And IoT must try to identify solutions to mitigate its drawbacks (Ponnalagarsamy et al., 2021).

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