

The Application of Big Data in Electrical Power System

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Abstract: *With the rapid development of information technology, the traditional electrical power system has also been greatly impacted, facing the transformation. Big data has powerful ability to collect, analyze, and process data. Data in businesses in all walks of life are growing at an unprecedented rate. People have a deeper understanding of data via the advent of the era of big data. The continuous improvement and improvement of big data technology has led to the rapid development of electric power big data, and has been used in power grid fault diagnosis, power risk assessment and other fields, providing a strong guarantee for the safe and stable operation of electrical power systems.*

Keywords: Big Data, Electrical power system, Intellectualization, Development trend.

1. Introduction

At present, the core of big data is to optimize valuable data structure for customers by mining valuable information from data [1]. Today's big data does not simply refer to the information that netizens see in the network, but also covers the numerous digital sensors on industrial equipment, mechanical design, and intelligent meters [2]. China's energy industry is developing rapidly, and energy demand is still growing. As the main energy supply method, coal-fired power generation plays an important role in the energy structure and is the key to achieving China's energy conservation, consumption reduction and emission reduction goals. With the advancement of digitization and information technology, the rise and rapid development of big data technology has attracted attention from all sides. In terms of theory, methods and applications, big data thinking and technology are introduced into power production, with a view to promoting the development of China's power production mode from extensive energy consumption, high emissions, and low efficiency to low energy consumption, low emissions, and high efficiency Green intensive development and transformation.

2. The Definition of Big Data and its Value

Big data refers to the collection of data that must be collected, managed, and analyzed with special software tools within a specified time range. It requires a new data processing model to make the data information have stronger decision-making power, high discovery and mining capabilities. Value-added information assets [3].

The value of big data can be described in the following aspects: (1)The use of big data technology for public opinion monitoring and tracking of public concerns can greatly improve social research capabilities; (2)With big data, enterprises can use the massive information formed by individuals' transactions or behaviors on the Internet to make

judgments and analysis, thereby achieving accurate marketing; (3)Big data can help enterprises grasp the customer's consumption demands in time, carry out scientific and effective product research and development, and achieve the integrated utilization of resources; (4)For enterprises that master mobile application core data, they can organize the data Analysis and formation of a trend development chart play an inestimable role in making strategic decisions for the entire enterprise.

For the power industry, the concept of big data is reflected in all aspects of power generation, transmission, transformation, power distribution, and power consumption and dispatch. It is the specific practice of its technologies and methods in the power industry. To better meet the different needs of various professional work in the power industry, and better serve the economic and social development.

3. The Application of Big Data in the Field of Electrical Equipment and Power System

3.1 The Significance of Big Data Application in Power System

Big data technology has many applications in China's power system, and can promote the stable and efficient development of China's power system. On the one hand, the application of big data technology can solve the difficulty of data collection and processing in China's power system. In particular, the power equipment involved in the operation of China's power system is constantly increasing, and the data structure type of each power equipment is also more complicated. Using big data technology can process these data information more effectively. On the other hand, the use of big data technology can also significantly improve the technical level of China's power system, and introduce advanced technologies such as data mining to improve the technical level of power companies.

3.2 The Actual Status of Big Data in Power Systems

In the development in recent years, China has been emphasizing the development of smart grids, and through the macro-control of policies and other aspects to improve the intelligent and automated development of grids in various cities and regions. However, in view of the actual situation in various regions of China, there are still many shortcomings in the final effect of smart grid construction. The main reason is that the power systems in many areas are not good enough to handle a large amount of data information generated during the operation of the system.

3.3 The Key Application Techniques of Big Data in Power Systems

3.3.1 Big data storage and processing technology

From the perspective of the relationship between big data storage and processing, the main storage and processing technologies are divided into stream processing and batch processing. A typical application of stream processing is stream computing technology, which is suitable for batch processing services such as multi-source heterogeneous data online assessment, power and load joint scheduling, and online monitoring of equipment in distribution networks that require high real-time performance. The core idea is to divide and conquer the problem and push the calculation to the data instead of the data. This processing technology is suitable for distribution network planning and other businesses that do not require high real-time performance but have a large amount of data. In view of the characteristics of smart distribution network with many measuring points, rapid changes in operating modes, and timeliness and relevance of some data, it is necessary to self-optimize and data compression technology for big data storage systems, fast retrieval technology based on multi-dimensional indexes, distributed streaming Research on efficient coordinated communication technology for heterogeneous nodes in the processing system, as well as correlation analysis of measurement data and cleaning and correction technology. In addition, since the intelligent power distribution network is a continuously developing system project, it is difficult to effectively ensure its feasibility, reliability, and scalability by logically collecting and controlling data from all aspects, and it integrates distributed file systems and distribution. Cloud computing such as distributed data processing systems and distributed databases can serve as the basic platform and technical support for big data storage and processing, and serve the application of big data in power systems.

3.3.2 Big data analysis technology

Big data analysis includes analysis and interpretation of data. Big data analysis is the process of discovering hidden patterns, unknown correlations, and other useful information by studying huge amounts of multiple types of data. Systematically manage the big data of the intelligent distribution network and treat each data set as a subsystem [4]. In the process of mutual communication between the

subsystems, there may be some new information, that is, the data system including data exchange and fusion has a qualitative improvement and a new leap compared to the data collection. In order to make the results of big data analysis more suitable for applications, it is necessary to interpret big data while analyzing. Big data interpretation is a process of deep analysis and multi-dimensional display of big data itself and its analysis process, and restore the results of big data analysis to specific industry problems. Because the analysis of the data itself is accompanied by the interpretation process, the interpretation of big data can also be regarded as a special method of big data analysis.

4. The Impact of Big Data on the Power System Industry

With the advent of the era of big data, electric power big data is of great significance for achieving refined management of power companies and improving the company's management level. The application of big data in power is bound to promote the development of the power industry and bring a profound impact on the power industry.

4.1 The Impact of Big Data on Big Planning

With the increasing coverage of distribution network planning business, the generated data also shows explosive growth. In this case, how to improve the ability of data collection, storage, and analysis is an urgent problem to be solved. The application of big data can solve these problems very effectively and improve work efficiency. (1) Forecast of power consumption: Based on a large amount of historical data on power consumption, combined with the area and population of the planned area and historical economic data, the power consumption in the area is estimated as further planning and design Basis. (2) Relevance analysis of multiple indicators: Through comprehensive analysis of numerous data obtained from multiple systems such as GIS and PMS, the results of the analysis are used as the basis for planning and design. (3) Prediction of space load: In the entire power grid, comprehensive analysis is performed on a large number of values such as the area of each small area, the type of land and the floor area ratio, plus the area load density and load value of each industry. In order to achieve the goal of forecasting annual load in the future.

4.2 The Impact of Big Data on Electricity Production

In terms of power production, the power production MIS system is used, combined with a large amount of data obtained from geographic information systems, and then analyzed according to the terrain, energy distribution and climatic factors in different regions, using big data technology to analyze, In the data, the information that is beneficial to the construction of the power grid is refined to achieve a reasonable allocation of power resources. This can also prevent the problem of insufficient power production due to lack of coal supply. In addition, the use of data mining technology can also analyze the impact of different factors on the power transmission power limit, and design a suitable

power transmission power limit to ensure the security of power grid operation. Therefore, using big data, a comprehensive analysis of various factors affecting the location of the generator, such as temperature, humidity, and wind, is then performed to select the best location to place the generator. This method can optimize the assets of power companies, and at the same time, effectively control their capital expenditures.

5. The Development Trend

5.1 Big Data will Change the way of Energy Supply for Power Generation

Wind power, solar energy, and distributed energy access including microgrids are all closely related to the electricity consumption behavior of front-end users. Since there is currently no low-cost and efficient energy storage system, how to allocate these energy sources a good combination of distribution networks requires the support of big data technology to form large, distributed energy sources. We must know that wind power and solar energy are uncertain energy sources, and they have a great impact on the power grid. For example, accurate prediction of wind power. This will change the energy structure and improve the environment.

5.2 Big Data Technology is an Important Foundation for the Future Development of China's Power Grid

In the future, big data technology will penetrate the entire power industry. The power industry contains huge data resources. At the same time, there has been a demand for data value. Developed countries have begun to research related data in the power field. For example, IBM has given its use. Intelligent and scientific smart power solutions, such as the intelligent power outage management system that manages and optimizes the power outage plan of the enterprise, helps the grid enterprise optimize the construction and transformation of the investment plan, and the smart grid evaluation and investment optimization decision-making system can intelligently sense the real-time operating status of the power grid and assist in supervision Intelligent decision-making of power grid status and alarm system. All these provide a reference for the future development of China's power grid.

5.3 The Application of "Big Data" in Smart Grid

At present, on the distribution network side, some relatively completed smart grid communities have been established in China, and power users can use smart sockets at home. Under this environment, user data can be effectively collected. Due to the large number of users, it is bound to produce large Data requires relatively big data technology to process and analyze, so as to further improve the intelligent service level of the power grid.

6. Conclusion

The application of big data is the general trend, and the "big

data era" has arrived. With the development and construction of the national smart grid, data from the power industry has grown dramatically. And the new generation of Internet technology represented by big data and cloud computing is more widely used in power systems. Therefore, big data technology will become a new growth point after the transformation of China's power grid development model in the future.

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