Research on Intelligent Diagnosis of Station Line Loss Based on Data Mining Technology

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Abstract. The construction time of the distribution network is long and the lines are complex. It is an important component of the power supply enterprise's business of reducing losses and increasing efficiency. Through the data mining processing method, based on the big data of the power grid, the use of computer automatic calculation, manual verification and other methods not only realizes accurate positioning of the crux, but also greatly saves analysis and processing time; and solves the line loss problem while completing the redundant and disordered files. The clean-up and repair of power stations and the standardized transformation of the stations with large technical line losses have reduced the power losses in the stations, improved the economic benefits of the power supply bureau and achieved remarkable results. The comprehensive management of the line loss in the station area requires the full cooperation of all relevant departments to effectively control and reduce the line loss rate, which can improve the utilization rate of electric energy, analyze the abnormal phenomenon of the line loss in the station area and further standardize the line loss management measures of the enterprise, so that the company Responding to various special situations becomes stronger.

Keywords: Data Management, Line Loss, Intelligent Analysis

1. Introduction

In the process of building smart power management, a variety of technologies need to be used, including data analysis, Internet technology, Internet of Things technology, etc. The Internet and non-computer objects are connected through Internet technology to achieve the purpose of data mining. For the entire data mining process, it is relatively complicated, including multiple steps of information collection, collection, sorting and storage. The information is fully integrated and the information is displayed intuitively to improve the work efficiency of the staff. Therefore, data mining technology...
plays a vital role in the construction of smart power management\cite{1}.

2. Data mining technology analysis

Collecting information is the foundation of data mining technology. In the process of building smart power management, the collection of information mainly includes various documents, teaching plans and other types of materials in the teaching process\cite{2}. Through the collection of information, it can be seen that the scale of data that needs to be sorted is very large and different data have different classifications and different structures and they need to be divided and sorted scientifically. The main characteristics of teaching data are rapid change and large growth. Data collection needs to be carried out in real time to ensure that data loss will not occur. Data is managed hierarchically, data management is standardized and teaching data can be used at the highest efficiency\cite{3}.

After completing data collection and sorting, information storage will begin. The construction of smart power management requires centralized storage of structured data. Conversely, distributed storage of data with unclear structures. When working on data storage, you cannot blindly store all kinds of data, which is not conducive to the later data search. At the same time, important data should be backed up to avoid data loss and serious consequences. All kinds of data have very important reference value for the development of the power system. Therefore, when the power system is building smart power management, we must pay close attention to data storage to pave the way for future development.

After completing the first two steps, you need to use computers for data analysis. Various advanced science and technology can be used to convert data into statistical graphs, tables and other intuitively understandable forms, integrate complex data and use scientific methods. Putting various data in the same analysis file and comparing and analyzing multiple sets of data intuitively can greatly improve the work efficiency of faculty and staff. Using computer technology to get rid of the traditional manual statistics and analysis, which is a complex process, reduces the waste of manpower and material resources and greatly improves the accuracy of data analysis. It is a skill necessary for the development of the times.

3. Traditional methods of reducing line loss

3.1. Optimize the structure of the power grid

Because part of the energy transmitted by the 0.4KV power supply line is lost in the grid structure, to improve the power supply quality of the 0.4KV power supply line, the grid structure where the 0.4KV power supply line is located must first be optimized\cite{4}. Before the grid structure optimization, relevant Management and staff should consult relevant materials, conduct detailed understanding and investigation of the power supply area of the power grid structure, especially for large-scale power-using places such as factories, rural areas and schools in the power supply area. The optimization of the structure is meticulous to the capacity of the transformer used and the setting of the maximum transformation coefficient. The grid structure of the power supply area is carefully analyzed and the power demand of the people in the power supply area is guaranteed. Reasonably extend the relevant high-voltage lines as much as possible, reduce the loss of the 0.4KV power supply line in the power transmission process and improve the power supply efficiency of the 0.4KV power supply line.
The schematic diagram of the power network is shown in the figure below.

![Figure 1. Schematic diagram of the power network](image)

### 3.2. Uniform voltage load

Compared with other high-voltage lines, the voltage delivered by the 0.4KV power supply line is lower and belongs to the low-voltage transportation power supply line. Just because the 0.4KV power supply line belongs to the low-voltage transportation power supply line, the load it carries during the power supply process should be relatively low. Low level, but in actual transportation lines, 0.4KV power supply lines often carry loads that exceed the level of the power supply line itself. This also causes some 0.4KV power lines to be overloaded for a long time. Therefore, related 0.4KV power lines Maintenance and repair personnel should adjust the load distribution according to the actual situation of power transmission by the power supply line and select the appropriate load for the 0.4KV power supply line, so that the 0.4KV power supply line can continue to work efficiently. The equalizing load mode is shown in the figure below.

![Figure 2. Equalizing load mode](image)

### 4. Station area line loss diagnosis based on data mining

#### 4.1. Data Mining Mode

The data mining method can sort out the relationship between households in Taiwan and districts. According to the relationship between households in Taiwan and districts, it can ensure that the marketing business application system generates a station area line loss assessment unit, which is conducive to the calculation of user power usage and the assessment and measurement points, so that power personnel can understand the score. The real-time line loss in the station area can also be used to
test the data mining effect. The specific implementation process is as follows: First, collect and verify data. The electricity consumption information collection system can automatically collect the total table of distribution transformers in the station area and the user's indicated number and the validity of the indicated number can be checked through the database backend and the daily average electric power of the qualified users can be calculated[5]. Second, calculate and count the line loss rate. The user information collection system can refresh the station area assessment unit according to basic information such as synchronized station area, distribution transformer, household change relationship, etc. and calculate the daily power supply and line loss rate of the station area in the database background, so that the station area line loss can be calculated Statistics on the rate distribution. Third, online intelligent diagnosis. In-depth analysis and research on the causes and performance characteristics of abnormal line loss in the station area and classification according to relevant standards. Establish a line loss management and control system in the station area through the analytic hierarchy process and with this system as the core, establish a database of abnormal reasons for the line loss in the station area. Fourth, system early warning and governance. Identify the area where the line loss rate deviates from the reasonable line loss rate limit of the station area and focus on warning the abnormal mutation station area of the line loss and find the users suspected of stealing electricity. Through the research and formulation of the abnormal line loss management method library in the station area, the treatment process of the abnormal line loss station area can be effectively tracked and the treatment effect can be fully demonstrated.

4.2. Collaborative management mode

The cooperative work of operation and distribution and the construction of the electricity information collection system can create favorable conditions for the line loss in the distribution transformer station area and comprehensively improve the timeliness and accuracy of line loss statistics. By formulating a technical plan for the integration and transformation of the distribution system and dividing the information change process in detail, it is conducive to managing the stock data and maintaining the incremental data. During this period, it should be ensured that the two systems have the same information. Secondly, pay attention to the construction and maintenance of electricity consumption information collection system to ensure the integrity of distribution transformers, electricity collection devices and user metering devices and improve the stability of collection rate and the accuracy of line loss statistics. Finally, the application of the integrated data of the distribution and adjustment is conducive to the establishment of the line loss statistics module and the expansion of the current branch line loss statistics. Improve and perfect the line loss analysis, audit and audit management process of the station area and use the management link as a marketing management checker to fully realize professional management[6].

5. Conclusion

Controlling the line loss rate within a reasonable range is an important business for the management of power grid enterprises. With the in-depth implementation of various policies for power reform, the scientific management of the power grid plays an important role in ensuring the economic benefits of enterprises in the process of power reform. As one of the core tasks of scientific management, line loss management is also an important task for grid companies to ensure long-term operation. In recent years, power grid companies have gradually increased their requirements for scientific management
and their management tasks have become more refined. The improvement of the supporting power automation system also puts forward higher accuracy and timeliness requirements for the perfection of line loss management.

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