Research on Electricity Supervision and Management Based on Information Acquisition System

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Abstract: Considering the status quo of electricity supervision and management of power supply enterprises, this paper proposes a power supervision and management program based on information collection system, which is mainly the construction of electricity supervision and management system. Based on the analysis of the function and performance requirements of the electric supervision and management system, the design scheme of the electricity supervision and management system based on information collection is proposed. This has promoted the overall efficiency of the power supply enterprise's daily electricity supervision and management business.

1. Introduction

Power supply enterprises are responsible for maintaining the stable operation of the society and promoting the sustainable development of the national economy. Electricity is the basis for the survival of power supply enterprises. With the rapid development of the economy, the electricity consumption of the society has grown, and the problem of electricity consumption has become more and more obvious. At this time, strengthening electricity supervision and management has become an important task in the sustainable development of power supply enterprises. Although the economic losses caused by the power stealing behavior of the State Grid have been decreasing year by year in recent years, there is still a small amount of electricity stealing. This not only undermines the current power supply order, but also damages the legitimate rights and interests of power companies and seriously threatens the security of the power grid. Therefore, how to prevent and combat electricity stealing and strengthen the use of electricity supervision and management is one of the important tasks of power companies. The power supervision and management based on the information collection system just meets the above requirements. Through the automatic collection, transmission, analysis and processing of the information data of the electricity customers, the functions of remote meter reading, electricity fee management and power abnormal information alarm for low-voltage residential customers are realized. This can effectively solve many problems in the current power supply enterprise monitoring and management, and at the same time improve the efficiency of power monitoring and management. First, the management of business quality has been strengthened. This will play the role of auditing and management of the electricity monitoring system, and improve the quality of power services through business audits and service quality supervision. The second is to improve the measurement and control system. Strictly implement the quality management standards and requirements of smart energy meters, implement the life cycle management of measurement assets, and improve the accuracy of power consumption information. In summary, the electricity supervision and management system based on the electricity information collection system realizes the innovation of the modern power grid management mode and meets the basic needs of building a unified and strong smart grid.

2. Demand Analysis of Electricity Supervision and Management System

The electricity supervision and management system is configured to the enterprise administrator and the electricity monitoring personnel. The information collection system is responsible for the real-time business data collection, and the data is sent to the user relationship background through

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the system. The business model is mainly for power information.

2.1 Overall Needs

With the rise of the Internet era, most industries are facing a situation of transformation and development. In view of the cumbersome process of electricity monitoring and the backwardness of the management mode, the electricity monitoring and management system is also facing reform and development. The focus of the system studied in this paper is to provide information collection, information query and trajectory tracking. The system allows the electricity supervision to monitor the use of the system to collect electricity monitoring data and user information at any time, accurately record the time, place and work content of the electricity supervision staff to complete the work, and collect electricity information in real time. The inspection route and the real location can be seen through the GIS. Through the system, various inspection logs can be recorded to timely handle user needs and complaints and improve service quality. The system enables management to monitor the work of employees in real time, collect electricity monitoring data and communicate the latest information on power supply companies, effectively monitor and evaluate the daily inspection of electricity, and ensure user inspection standard is consistency with the actual operation. Through this system, the power supply company can increase the interaction with the user and understand the feedback of the user, so as to promote the product [1]. At the same time, it is possible to help the electricity supervision staff to improve the power supervision capability through system guidance and complete the power supervision task.

The contents of electricity monitoring are as follows: the user implements the national regulations, guidelines, policies, standards, etc. regarding the supply and use of electricity, the safety status of electrical equipment, security measures for security power and non-electricity, anti-accident measures, qualification of the electrician entering the network, safety status of the network operation and safety measures for the operation, implementation of planned electricity consumption and saving of electricity, the use of electricity metering devices, safe operation of electric metering devices, power load control devices, relay protection and automatic devices, dispatch communication, etc., performance of power supply contracts and related agreements, power quality of power receiving terminals, illegal use of electricity and electricity stealing, grid-connected power supply and self-supplied power supply grid-connected security [2].

2.2 Functional Requirements

(1) Inspection personnel management. Through the system, the power monitoring staff performs related operations such as adding, deleting, modifying and inquiring, and dispatching work in real time according to the power usage.

(2) Inspection object management. A timely message reminder of the task is realized by associating the contact information with the tasks related to the relevant inspection object. The newly collected inspection object of the information collection system is assigned to the current collection personnel by default, and the information of the inspection object is maintained by the current personnel.

(3) Power stealing management. The electricity supervision and management system introduces the power stealing management function, and uses the content of the stealing power to perform input management, query and maintenance. Among them, the function of illegal electricity stealing management also includes reward approval management and power stealing management.

(4) Check the work query. The search engine function is mainly used to query the system power inspection tasks, inspection information and personnel information. In this module, the inspection staff can grasp the acquisition of information in real time.

2.3 Non-Functional Requirements

In addition to the above functional requirements, the entire electricity monitoring management system should meet some additional non-functional requirements. The non-functional requirements of the system are mainly to solve the system requirements that cannot be reflected in the functional modules in the actual operating environment. This article focuses on non-functional requirements

analysis in terms of availability, reliability, and system support: (1) Server-side performance requirements: Send requests, page jumps, data queries, and updates to the power client in a timely manner. (2) Performance requirements of the power client: respond promptly to the operations performed by the user on the interface, the better anomaly mechanisms include fault tolerance mechanism, network reconnection, timeout and other reminders.

3. Design of Electricity Supervision and Management System

The electricity supervision and management system based on the information collection system was developed under the guidance of layered design. The system design is divided into presentation layer, application layer, service layer and data layer. The presentation layer is the B/S client. The application layer delivers monitoring presentations, thematic analysis, advanced applications, and basic maintenance through the business sub-layer. In the application layer, the system needs to implement the design of the external interface. The service layer is for data access services, messaging services, rights services, reporting services, and other services. The data layer is the application and management of the database. In the electricity supervision and management system, the SG186 system, the power system acquisition system and the prepaid sales system can be used as reference. The electricity supervision and management system architecture is shown in Figure 1.

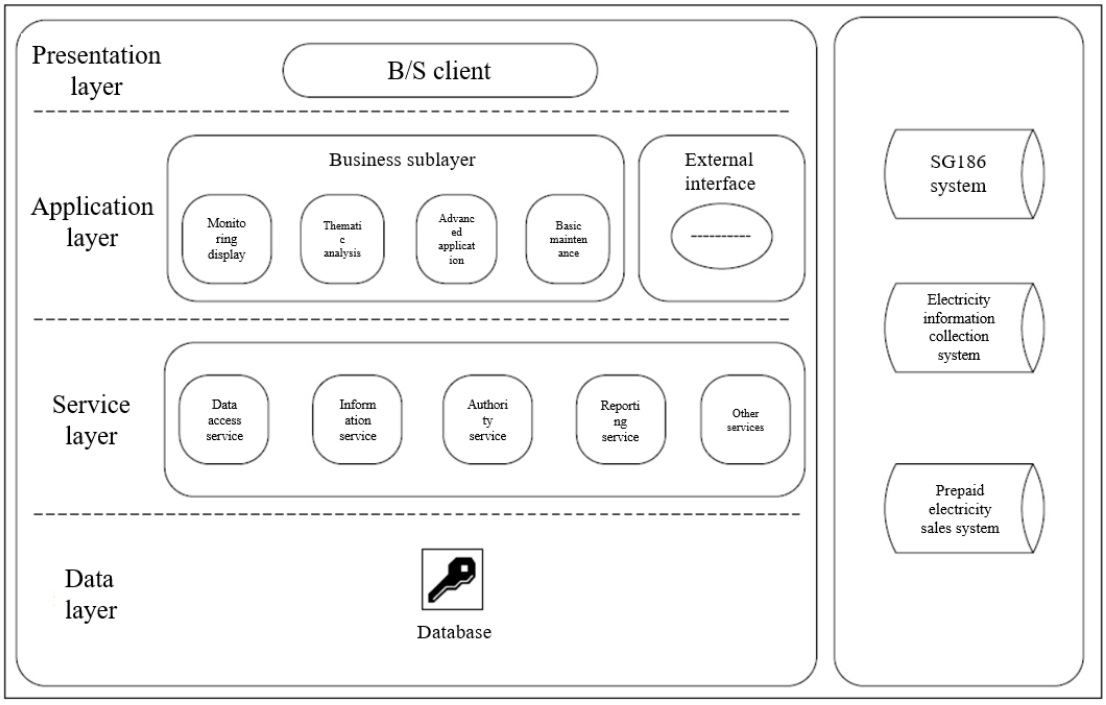

Fig.1 Architecture of the Electricity Supervision and Management System

(1) The user management module includes the following sub-modules: user registration, user login, page browsing, modifying personal information, changing passwords, and retrieving passwords.

(2) Inspector management includes the addition, deletion and re-inspection of the inspection work. First, the system user needs to log in and register, and obtain the dispatch and inspection information. Under the guidance of the system inspection task, the inspector finds relevant work information and performs inspection work according to the screening. This module needs to add administrator and user login privileges

(3) Check object management function, which allows the system administrator to find the corresponding inspection items and check the inspection to determine the executableness of the project. Checking object management functions requires project development, review, and template application.

(4) The three inspection management includes routine inspection cycle maintenance, make routine inspection plan, routine inspection work order generation, make special inspection plan,

special inspection work order generation, make power supply inspection plan, and power supply inspection work order generation. In the face of the three inspections, the user can formulate three corresponding inspection contents.

(5) Management of electricity inspection work orders mainly include inspection work order processing, inspection work order management, batch printing work orders, and inspection work order maintenance. The user adds, modifies, deletes, and queries the self-checking work order information according to the inspection information, and prints, inquires, and performs the transfer operation on the dispatched electricity monitoring work order.

(6) In order to ensure the standardized management of power supply companies, incentives for approval and management of illegal electricity theft have become measures for the company's development. Therefore, the tamper management module needs to be integrated into the inspection management system. In the system, the module realizes the reward and punishment fair disclosure including reward approval management, thief claim management, insurance out-of-risk management, and default thief classification query. The corresponding violation handling method also needs to be entered into the system.

(7) The query function is the technical difficulty that the management system development needs to jointly overcome. In the face of the inspection work query function, the developer needs to integrate the information of the inspection work, including the inspection personnel information, the three inspection information, the violation record, the reward and punishment information, the superior manager and the inspection project information. Checking job queries is done in accordance with system development principles.

4. Conclusion

Through the testing of system functions, the functions of each module meet the overall requirements. The system runs stably, the execution time and delay time meet the requirements, the reaction speed is faster, the execution time and delay time meet the design requirements, and the system power monitoring and control efficiency is relatively high. However, in the actual testing process, some new problems were found and need to be improved, mainly in the following aspects:

(1) Lack of logistics management check function. The electricity process data check is not only the real-time data of the current waterline, but also the equipment management of the logistics department, the equipment inventory equipment reserve, material procurement and consumables management. Although these data do not require real-time inspection, long-term and regular queries and analysis are necessary. The use of consumables and the procurement of materials can reflect the efficiency of the wires and the operation of the electrical equipment.

(2) The electricity supervision system is closely linked to the management of the power supply company. The standard value of the data check is often combined with the actual power usage. For example, in order to handle business changes, inspectors can obtain power consumption data in real time, but do not know which kind of service is being used, and need to be obtained through other systems. This is a deficiency of the system, and the power resources should contain part of the electronic power.

(3) With the gradual upload of power data, the content will increase, and the performance of the server will be severely tested. Although it is possible to set up maintenance scripts that run automatically on a regular basis, an increase in storage files is inevitable. It is best to configure the backup server to store the backed up data if possible. At the same time, the backup server can increase the system's ability to resist risks.

References

[1] Hu Fan. Application of Bluetooth and GPS integrated technology in power supervision system. Zhejiang University, 2007.

[2] Feng Yang. Research on electricity supervision and management based on electricity

information collection. North China Electric Power University, 2015.

[3] Sun Guoxue. Application research of electricity supervision and management for largeusers. North China Electric Power University, 2008.

[4] Li Yajun. Design and research of power consumption information collection management system of Tianjin electric power company. Tianjin University, 2010.