

## Application of Internet of Things Technology in Power Security Control

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**Abstract**— People's work, study and daily life are closely related to electricity, which puts forward higher requirements for power safety control. How to ensure power safety has also become the focus of social attention. The use of Internet of things technology in power security can improve work efficiency, reduce resource waste and avoid safety accidents. Starting from the importance of power security management and control, this paper explores the application of Internet of things technology in power security management and control under the background of big data, and investigates the impact of the use of Internet of things technology on power security management and control.

**Keywords**- *Big Data Era, Internet of Things Technology, Power Security, Power Security Management and Control*

### I. INTRODUCTION

With the improvement of people's requirements for daily work and learning, they also have higher requirements for big data technology, Internet of things technology and power security management and control. The frequent occurrence of power safety accidents urges people to find new technologies and new management modes to manage power systems [1]. In general, power safety control is considered to be a difficult and risky work, because the output intensity of voltage is different, and the safety risks it brings are also different. The safety accidents are as small as breaking and as large as fire [2]. The previous power safety management and control is relatively backward compared with the current power safety management and control using new technologies. It does not form a set of effective solutions for the possible hidden dangers of safety accidents, and the management lacks a set of effective management solutions for power safety problems [3]. Applying Internet of things technology to power security management and control, managers believe that this is a conceptual innovation of power security management and control, which can more efficiently solve the hidden dangers of power security and improve the safety awareness of managers [4]. Internet of things technology must take computer equipment as the main carrier and use new means to carry out multi-dimensional monitoring of power security, so as to ensure that power security management and control can be realized under the condition of minimum personnel utilization and maximum efficiency [5].

The research on Internet of things technology is regarded as a data sharing platform to meet people's new needs in production and life, and relevant research results have been shown [6]. Researchers believe that it is necessary to organically combine big data and Internet of things technology. As a modern new technology, it can

ensure that the equipment can quickly calculate data information and ensure data authenticity in the process of data collection and transmission [7-8]. Education and manufacturing in the new era are closely related to Internet technology and power utilization. Power security management and control has become the basis for the orderly implementation of industry, commerce and education in China. Only by combining power security management and control with new technologies can we maintain the stability of power output [9]. Current researchers have concluded that the automatic operation of power safety management and control not only makes the power safety management process more convenient and efficient, but also increases potential risk factors [10]. It is necessary to focus on the detection of power value, the control of output voltage, the dispatching safety between major power grids and the safety control of power input in the power safety control, and rely on the application of Internet of things technology to ensure the stability of power safety control [11-12].

This paper mainly studies how the Internet of things technology can efficiently solve the risks in the process of power security management and control in the era of big data. By analyzing the advantages of the Internet of things technology, it can solve the potential safety problems in the process of power consumption and improve the efficiency of power security management and control. The main research of this paper is as follows: first, learn the concepts and characteristics of Internet of things technology and power security management and control, and the importance of power security management and control to China's economic and social development. Second, analyze the advantages of using Internet of things technology in the process of power security management and control in the era of big data, as well as the main applications of Internet of things technology in power security management and control. Third, investigate the impact of the application of Internet of things technology on the power consumption behavior of various regions in Changchun.

### II. INTRODUCTION IOT TECHNOLOGY AND POWER SECURITY CONTROL

#### A. The Concept and Characteristics of the IOT Technology

Big data drives the development of the Internet. Based on Internet technology, American scientists put forward the concept of IOT technology. The Internet of Things refers to the transfer of data through a network platform, establish a corresponding database, and realize the sharing of data and information among major industries. The realization of IOT technology requires the use of new

technologies and based on these new technologies to realize data sharing between things and form an intelligent management system for power safety control, thus effectively reduce the waste of manpower and material resources. If power safety control can be used in power grid operation for a long time, it must combine power safety control and IOT technology organically. With the help of data sharing technology and intelligent sensing technology, it can process the received power data and realize the data sharing among devices. Only when the power data of each device is accurate and the data information processing process is highly efficient, can the work efficiency and quality of power security control be significantly improved.

#### B. The Concept and Importance of Electric Power Safety Control

In the past, people's lighting mainly relied on fire resources, and the principle of equipment operation was mainly physical principles; now people's lighting relies on electricity, and the operation of equipment in work and life also mainly relies on electricity resources. Power resources make the rapid development of society. Compared with fire resources, power resources are safer, but it still has many safety problems, and managers are still constantly exploring power safety control. Power safety control refers to the construction of the power grid, power input and output process, power application of power grid safety management, power safety control process requires input electricity, power transmission, power output and shunt process implement effective management, ensure the safety of electricity system from all angles, to avoid electricity safety accidents. Power security control plays an important role in promoting the rapid economic development of cities. The safety of the power generation system, power transmission process, substation equipment, power distribution and other processes of the power system is the basic guarantee for enterprises or families to use electricity. It can adjust the voltage according to the power demand of enterprises and families. Combining the control of the operation of the power grid with the detection equipment, it can conduct automatic intelligent monitoring of the whole process of electric energy transmission of the power system, and also regulate the electric power output size on the computer equipment. Even if security problems occur, they can be quickly discovered through the IOT technology, and professionals can quickly solve security risks.

#### C. Application and Advantages of the Use of IOT Technology for Power Safety Control

The use of Internet of things technology in power security management and control can realize data information sharing between different power equipment. Big data technology can provide power managers with a large amount of power information. When used together with cloud computing technology, it can also detect power parameters and reduce the possibility of power security accidents. The application of Internet of things technology in power security management and control is as follows: 1. In the application of power detection, power detection is the focus of power security management and control. Using Internet of things technology, we can analyze a variety of power signals, compare and analyze data forms in combination with database information, and form a

power management monitoring system. 2. In the application of power control, the power control in power security management and control can stably output power statically or dynamically. Combined with big data technology, it can lock the fault range and analyze data in real time. 3. It is used in dispatching to collect power information during system operation. Managers can analyze equipment status according to power information, effectively reduce maintenance time, improve power safety control efficiency, and provide safety guarantee for power input and output. In order to fully analyze the power data information, this paper uses the variogram method to determine the weight of each data element. The function formula is shown in formula (1). In order to determine the faulty equipment, the coincidence accuracy in its position is analyzed using formula (2).

$$w = \frac{v}{\sum_{i=1}^n v_i} \quad (1)$$

$$\sigma_i = \sqrt{\frac{\sum \Delta_i^2}{n-1}} \quad (2)$$

In formula (1):  $w$  is electric energy data;  $v$  is the coefficient of variation of electric energy data; in formula (2):  $n$  is the number of observations, and  $i$  represents the variable.

### III. QUESTIONNAIRE ON THE INFLUENCE OF IOT TECHNOLOGY ON ENTERPRISE ELECTRICITY BEHAVIOR IN POWER SAFETY CONTROL

#### A. Purpose and Target of Investigation

The main objective of the survey is to research the safety management system of the power system, discuss the importance of power safety control, and the influence of voltage level on the power consumption behavior of enterprises. The object of this survey is large and medium-sized enterprises in all regions of Changchun City. Under the condition of ensuring the balanced proportion of spot check enterprises in each region, they will investigate the electricity consumption and electricity violations of each enterprise.

#### B. Investigation Method

The use of the power safety control of the technology of the IOT on enterprise electricity behavior questionnaire, for the investigation of each enterprise electricity behavior, based on the related problems of power safety control questionnaire, the questionnaire to the enterprise electricity safety management personnel, a total of 100 enterprises issued questionnaire. In order not to affect the normal operation of enterprises, the electronic questionnaire method, the questionnaire has 20 single topics, so that they can complete it in a short rest time. When the questionnaire is completed, the investigators process the data.

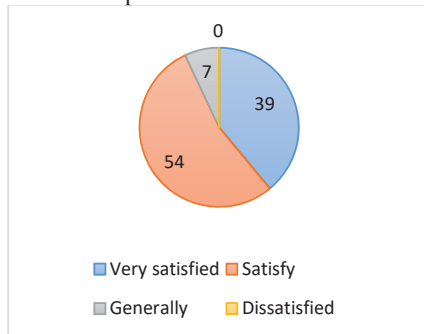
#### C. Survey Results

This questionnaire survey on the impact of the use of IOT technology on enterprise electricity behavior in power safety control will be recovered after completion. The investigators will conduct specific data analysis on this survey data. The analyzed data results will be elaborated in the result analysis part of the article, and only briefly explained in this chapter.

#### IV. ANALYSIS OF THE INVESTIGATION RESULTS OF THE USE OF IOT TECHNOLOGY ON ENTERPRISE ELECTRICITY BEHAVIOR IN POWER SAFETY CONTROL

##### A. Attitude of Enterprises Towards the Application of IOT Technology in Power Safety Control

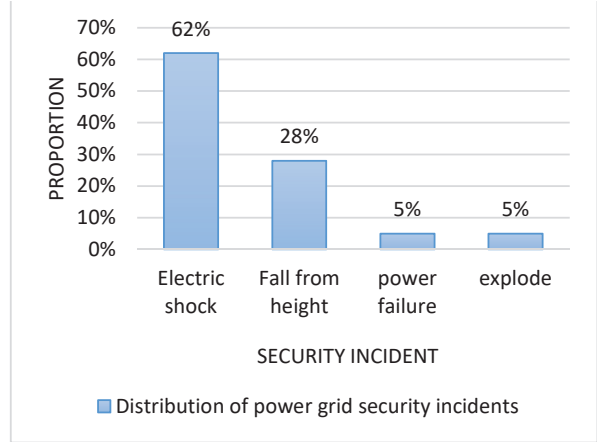
Internet of things technology has many advantages in power security control. It is widely used in major small and medium-sized enterprises. The attitude of enterprises towards Internet of things technology in power security control can be divided into four levels: very satisfied, satisfied, general and dissatisfied. According to the survey results of enterprises' attitude towards the application of Internet of things technology in power security control, as shown in Figure 1, it is analyzed from Figure 1 that 39 enterprises are very satisfied with the application of Internet of things technology in power security control; 54 enterprises are satisfied with the application of Internet of things technology in power security management and control; 7 enterprises hold a general attitude towards the application of Internet of things technology in power security management and control. No enterprise is dissatisfied with the application of Internet of things technology in power security control. It shows that the major small and medium-sized enterprises are very satisfied with the use of Internet of things technology in power security control. While processing and transmitting various power data, Internet of things technology can improve the work efficiency of power security control and save human and material resources for major small and medium-sized enterprises.



**Figure1.**Attitude of enterprises towards the application of IOT technology in power safety control

##### B. Electricity Safety Risk Factors Existing in Enterprises

The normal output of power grid can ensure the normal power supply of enterprises, and then ensure the normal operation of large and small enterprises. Therefore, this paper analyzes the distribution of possible safety accidents in the power grid, as shown in Figure 2: in the process of power transmission, the most common safety event is electric shock, accounting for 62% of total safety event distribution; the least safety event is explosion and power failure, each accounting for 5% of total safety event distribution; the falling problem accounts for 28% of total safety event distribution.



**Figure2.** Electricity safety risk factors existing in enterprises

Power safety may directly affect the development of large, medium and small enterprises. If managers can give corresponding solutions for various power safety risk factors, many safety accidents can be avoided. Therefore, the risk factors of power safety in the process of power use of enterprises are investigated, and the investigation results are analyzed. The survey results of power safety risk factors in enterprises are shown in Table 1. According to the analysis of Table 1, the common risk factors in the power consumption process of major small and medium-sized enterprises include electric shock, mechanical failure, sudden power failure, fire, explosion, line failure, etc., of which the most frequent power safety risk factor is line failure, occupying 38% of the distribution of power safety risk factors; The second is electric shock, which accounts for 30% of the distribution of electric safety risk factors. It shows that major small and medium-sized enterprises need to regularly repair the line and strengthen the training of employees on power safety and protection. 17% of the distribution of electrical safety risk factors occupied by mechanical faults; 12% of the distribution of power safety risk factors occupied by sudden power failure. Fire and explosion occupy 2% and 1% of the distribution of electrical safety risk factors. It shows that the machine may be aged during long-term operation, and it also needs regular maintenance to ensure safety. Although the number of fires and explosions is small, the destructive power is strong, so it is more necessary to strengthen protection and eliminate risk factors.

**Table1.**Distribution of possible electricity safety risk factors in enterprises

Electricity safety risk factors	Proportion
Electric shock	30%
Mechanical failure	17%
Sudden power failure	12%
Fire	2%
explode	1%
Line fault	38%

#### V. CONCLUSIONS

The development of economy and society cannot be separated from the use of power resources, but in the process of using power resources, the managers of large

and medium-sized enterprises must strengthen power safety control and improve employees' awareness of electricity safety. Applying the IOT technology to power security control can improve work efficiency and save costs. According to the survey results: a total of 93 enterprises are satisfied with the application of IOT technology in power security control, indicating that major small and medium-sized enterprises are highly satisfied with the use of IOT technology in power security control. Electric shocks accounted for 62% of the total distribution of safety incidents, indicating that employees should strengthen training to reduce the occurrence of electric shocks. Line failure occupies 38% of the distribution of electrical safety risk factors, and the distribution of fires and explosions occupies 2% and 1% of the distribution of electrical safety risk factors; it shows that machinery needs regular maintenance to ensure safety, and more destructive risk factors should be more appropriately emphasized. It is expected that there will be no electricity safety accidents in the future.

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