

Research on Key Technologies of Substation Automation

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Keywords: Key Technology, Substation Automation, Science Aspect

Abstract: Electricity is the main energy source of human society. It plays an important role in production and life and plays an important social function. No matter whether it is daily life or enterprise production, it is inseparable from electric energy. Human beings have strong dependence on electric energy. Household appliances, or mechanical equipment, will not function properly, and it is of great significance to ensure the stability and safety of the power system. With the rapid development of the economy, the demand for electricity in the society is increasing, the difficulty of power supply is increasing, and unplanned power outages often occur. It is obvious that the traditional power supply mode cannot meet the development needs of the power industry. The integration of electrical engineering and its automation technology in the power industry has promoted the realization of power system automation and provided a path for the construction of intelligent power systems. Power system automation can greatly improve power supply stability and reliability, reduce failure rate and loss rate, and is worthy of promotion and application. This paper will conduct research and analysis on the development of power system automation under electrical engineering and its automation technology.

1. Introduction

Electric energy is the cornerstone of scientific progress and economic development. The power industry is a basic industry and plays an important role in social development. With the continuous deepening of the power system reform, the competition in the power market is intensifying, and users are increasingly demanding the quality of power supply. In order to adapt to the new market environment, enhance the competitive advantage, and reduce operating costs, power companies must strengthen the application of electrical engineering and automation technology to build an automated power system, improve power quality, and ensure the safe operation of the power system. The application of electrical engineering and its automation technology in power system realizes automatic and unmanned power supply, realizes automatic detection and elimination of equipment failure, greatly reduces power consumption and human resources consumption, and improves the social and economic benefits of power enterprises. Promoted the sustainable development of China's power industry.

2. Electrical Engineering and Automation Technology

Electrical engineering and its automation technology is a comprehensive discipline, involving: power electronics technology, network control technology, automation technology, mechatronics technology, computer technology and many other modern high-tech. Its main features are the combination of strong and weak electricity, the combination of components and systems, the combination of hardware and software, and the combination of electrical and electronic technologies. This technology is an emerging science in the field of electrical information. It was born in the 1970s. In the late 1990s, electrical engineering and its automation technology were integrated into the industrial field, which brought industrial development to a new stage, greatly improving industrial productivity and reform. The industrial production mode has effectively promoted economic development and construction. In 2002, the technology was rated as a national key science, its technology level is getting higher and higher, the technology types are more and more abundant, the technical system is continuously improved, the application scope is wider and

wider, and it has quickly become the core of industrial production. The power to automate industrial production.

The integration of electrical engineering and its automation technology into the power system has become the mainstream trend of modern power development. Electrical engineering and its automation technology are important technical means to realize power automation and power intelligence. Electric power companies such as Nanrui Power Company, Ziguang Power Company and Shenrui Power Company have developed their own power automation systems based on electrical engineering and automation technology. Power system automation not only improves power supply quality and efficiency, but also ensures power supply reliability and stability and power grid strength. Many Western developed countries began research on power system automation technology as early as the 1970s. However, China's power system automation was first studied in 1987, and due to financial and technical constraints, it did not achieve the ideal research success, but the research filled the academic gap of China's power system automation. In the late 1990s, China began to invest a large amount of money in the research of power system automation under electrical engineering and its automation technology, and achieved remarkable results, and developed a power automation system. After the 21st century, China's power automation system began to enter the practical stage. The application of electrical engineering and its automation technology in power system realizes: automatic power dispatching; automatic power generation control; automatic safety analysis; automatic data acquisition; automatic power generation two control; automatic voltage control; Automated systems can be used for power plants: automatic detection, energy estimation, regulation, monitoring and management, which can greatly improve plant operation efficiency and reduce power generation costs and equipment failure rates. In the process of power generation, many processes can use automated systems instead of manual operations to effectively reduce labor intensity and improve work efficiency. And the automation power system has flexible operation interface, visual features, and simple and convenient operation. At present, many new power systems in China have begun to try to apply electrical engineering and automation technology. For example, CC-2000, OPEN-2000, SD-6000 and other systems used in power dispatch automation construction. These automated power systems are powerful and can be adapted to different environments to meet different usage requirements and provide different acquisition subsystems. The CC-2000 system has been put into practical use in more than 30 power projects. It can provide VME bus control system and terminal server system. It is not only flexible and adaptable, but also has good stability and reliability. The open design incorporates event-driven technology and packaged idea design theory with good performance.

3. Problems in substation automation

Substation automation relay protection function and design problems. The most important component of a substation is the relay protection device, which can quickly cut off the faulty circuit to protect the original and avoid damage to the substation due to the failure of the original. At present, many substation relay protection devices have many defects in the design process. The designed relay protection equipment can not fully exert its protection effect, which seriously affects the work of other equipment in the substation, which makes the substation very easy to fall into a paralyzed state. 2.2 Problems with the automatic test function of the device. The normal operating environment is the basis for the device to function. The relay protection device plays an important role in maintaining the normal operation of other devices. The relay protection device can be protected within a certain range of protection values, but beyond this value range, the protection is invalid. At this time, technicians are required to regularly check the relay protection equipment, and debug the protection values of the relay protection equipment according to the experience and knowledge provided by them. When the other equipments have problems, the relay protection equipment cannot play its protective role, but the impact The efficiency of the entire substation. 2.3 Problems with communication network interfaces and protocols in substation automation. The substation needs to cooperate with each other in order to operate safely and smoothly. At present, when constructing a substation in China, we will consider purchasing equipment in multiple

manufacturers. Since the state does not have the specification requirements on the communication network interface and protocol, the equipment produced by each manufacturer is different, and some manufacturers have irregular production processes. The product is unqualified, resulting in the device not being compatible with the communication interface, which makes it more difficult to construct the substation. At present, the application of substations is more and more extensive, and the state should introduce corresponding specifications to make the equipment produced by different manufacturers compatible with each other and reduce the difficulty of substation construction.

Substation automation acceptance and periodic verification issues. The application of substation automation technology is more and more extensive, and the acceptance and verification of substation has become an important issue that people can't ignore. Since there is no uniform standard in China to regulate the design of substation, the design of each system in the substation is different, so the post-testing and verification becomes a problem in the production and operation department. Moreover, the rapid development of technology makes the system update very fast, and the training of the operation management personnel is not great, so the inspection personnel do not have enough knowledge, can not timely check whether the equipment is faulty, and cannot clean up the minor faults in time. Substation equipment has a large risk, which is very likely to cause the paralysis of substation equipment.

4. Development of substation automation technology

Line integration in substation automation. The degree of substation automation is closely related to the application of integrated circuit technology of relay protection equipment. The application of integrated circuit technology can improve the automation degree of the substation, and can realize the communication and transmission of information between the modules of the relay protection equipment, so that the relay equipment Get the management of the system. The integrated information collected by the line is more complete and stored centrally in the substation automation system. There is no purchase of stored data equipment, which reduces the consumption of funds. Moreover, the use of line integration enables faster communication between information and improves the ability to calculate and process data. 3.2 Implementation of digitalization in substation automation. Nowadays, only more devices that use high intelligence will make them more productive. To increase productivity, they must be produced with highly automated equipment. With the deepening of substation automation, the application of high-intelligence equipment in substations in China is gradually mentioned in the agenda. Substation can use digital to monitor related equipment and complete maintenance and scheduling of related equipment according to digital information statistics.

Implementation of standardization in substation automation. At present, the domestic technical level is still relatively weak, and the degree of substation automation is not high. The main reason for affecting this problem is that the standardization degree of China's automation system is not high. Therefore, the state should strive to improve the degree of system standardization in our country, establish a project team to conduct research, and set up uniform standard equipment that meets the current requirements to meet people's demand for power resources.

Multimedia technology is applied in substations. Multimedia technology is currently the most widely used technology. The information that multimedia can hold includes: audio, video, pictures, text. The application of audio in the substation is reflected in the voice alert, reminding the staff of the substation whether there is a fault and reminding pedestrians to be safe. The application of video in the substation is embodied in the man-machine interface, showing the working state of the substation through pictures and text. Through the use of multimedia technology, the operating staff can monitor the various conditions of the substation in real time. According to the huge data information record when the fault occurs, it is easier to solve the fault, greatly reduce the consumption of human and material resources, and maximize the production efficiency.

Application of fiber optic communication networks. Fiber optic communication has many advantages. For example, optical fiber communication transmits a large amount of information, has

a long transmission distance, and is not easily distorted during transmission, ensuring complete and accurate information; and optical fiber transmission can be transmitted in a harsh environment, free from electromagnetic fields, high voltage and high current. The impact of the completion of the delivery of information. Therefore, most substation automation technologies use light as the medium of transmission, and use the fiber-optic communication network to control the substation in real time and collect multimedia data.

5. Conclusion

The degree of automation of the substation determines the production efficiency of the substation, and the size of the production efficiency determines whether the user's demand for power resources can be met. With the development of the economy, people's requirements for power resources are getting higher and higher. To meet this demand, the country must pay more attention to the research of substation automation systems. In view of the problems in the substation automation system, the technicians need to find ways to improve and realize the automation of the substation, so that it can better contribute to the economic development of China.

References

- [1] Hu Xiaojuan. Application of digital substation automation technology [J]. Science and Technology Information, 2014.
- [2] Yang Xiaojing. Digitalization trend of substation automation system [J]. Jiangsu Electrical Engineering, 2015.
- [3] Zhao Yang, Ding Baofeng, Du Cui, Zhao Ming. Discussion on the innovation and application of electrical automation technology in thermal power generation [J]. Silicon Valley, 2014(03): 93-94.
- [4] Zhang Huigang, Yang Zhichao. Innovation and Practice of Teaching System Reform of Power Grid Monitoring Technology [J]. Journal of Nanjing Institute of Technology, 2013(04): 56-60.
- [5] Li Mingqi. Installation, Installation and Test of Electric Cable [J]. Rural Electric Gasification, 2005 (06): 16.