

# Thinking on the development of power system automation based on electrical engineering and automation technology

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**Abstract:** Electric energy, as an important material basis for the survival and development of human society, is closely related to the national economy and people's livelihood and strategic competition. Throughout China's power system, if we want to fundamentally guarantee the sustained growth of social economy, we need to ensure the quality and safety of power supply in the whole system. In recent years, with the continuous enrichment of the types and form of electrical products, the demand for power resources in social production and life expanded gradually, to a certain extent, it stimulated the application of all kinds of electrical appliances in electronic technology. Especially, the electrical engineering and its automation technology are widely used in the construction of various projects. Through their own standardization and refinement, the electric power system has greatly promoted the progress and development of the power system in the aspects of operation reliability and stability.<sup>[1]</sup> This paper focuses on the electrical engineering and its automation technology, and analyzes the advantages of its application in the power system, and looks forward to the future development trend of the technology in the power system from the perspective of long-term interests.

**Keywords:** Electrical engineering; automation technology; power system; future development; thinking

## 1. Introduction

In the actual operation of the power system, the comprehensive popularization and application of electrical engineering and its automation technology have realized automatic control of power dispatching, data acquisition, voltage control, safety analysis, power generation and power machinery, etc. In the process of power supply, the system equipment can automatically detect, adjust, detect and troubleshoot its own running condition. It can not only reduce the excessive waste of power generation operation cost, but also can effectively reduce the probability of equipment failure. In addition, in the actual power generation process of power system, the active transformation from traditional artificial operation to intelligent automation program has been gradually realized, which reduces the work intensity and pressure of personnel, helps to improve the overall power supply efficiency, and can guarantee the double harvest of the economic and social benefits of the electric power enterprises and lay a solid foundation for the healthy development of China's general power industry in the future.

## 2. A comprehensive overview of electrical engineering and automation technology

In a broad sense, the electrical engineering and its automation technology are essentially a comprehensive and

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doi: 10.18063/scr.v2i2.482

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completely new technical means. It is a technical type which integrates network control technology, computer technology, power electronics technology, automation technology and mechatronics technology, the integration of strong power and weakness, the integration of software and hardware, and the integration of systems and components are fully realized, this technology is widely regarded as a key breakthrough at the technical level<sup>[2]</sup>. The application of electrical engineering and automation technology in China is late. It can be traced back to the 70~90 era of the first century. Now it has entered the stage of development.

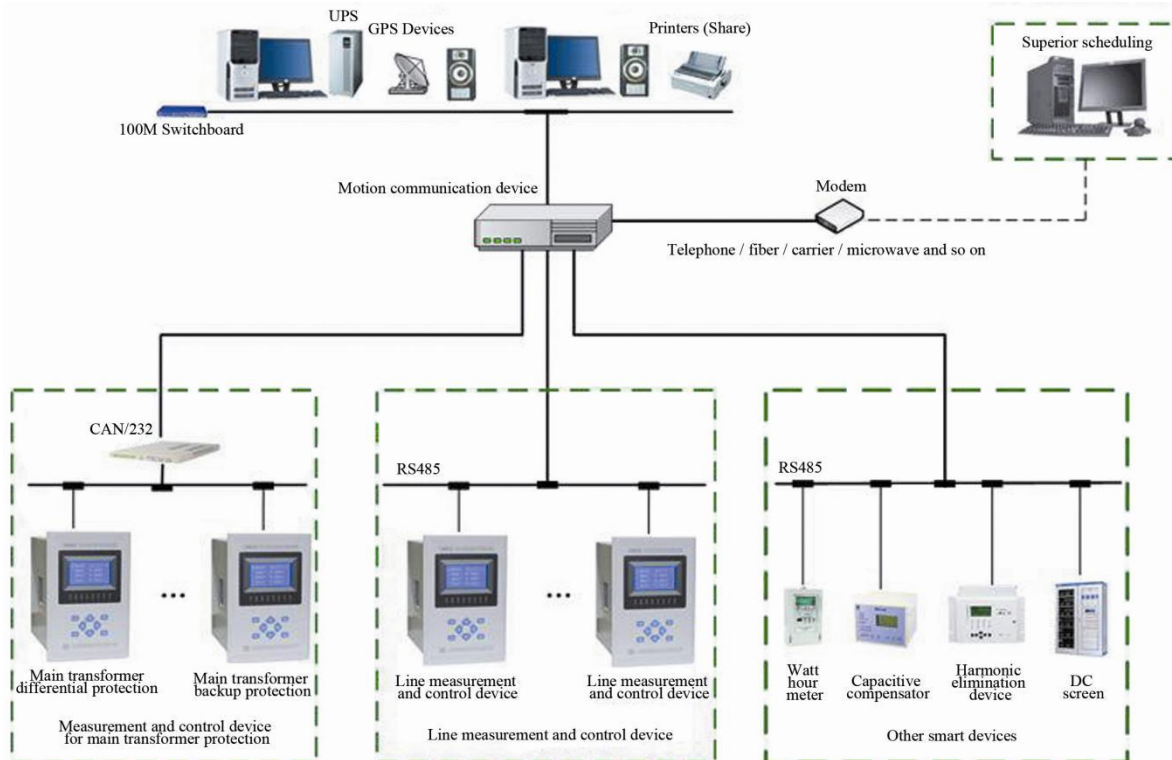
The comprehensive promotion and popularization of this technology in the electric power field has effectively improved the overall production efficiency and production quality of power production enterprises, realized the transformation and upgrading of production methods, and greatly promoted the economic development efficiency. After decades of development, at the beginning of the 21st century, the relevant research departments of the country formally classified electrical engineering and automation technology into key technology research disciplines. It has intensified the research on modern technology, promoted the rapid improvement of the overall technical level, and gradually diversified the technical types, and realized the automation of industrial production in a real sense<sup>[3]</sup>.

### **3. Key technology of power system automation**

From the relevant policies and announcements that have been published by the country at present, in the process of system automation research, the investment of policy funds has been increasing, and the research has been completed and applied in the process of practice. In terms of content and type, it is more and more rich and perfect, and continues to extend on the basis of basic functions, so it has good market prospects. This research mainly analyzes several key technical points in power system automation technology, including dynamic security monitoring system, intelligent control technology, flexible AC transmission system, multiple integration technology and simulation technology.

#### **3.1 Dynamic security monitoring system**

Generally, the security and stability of the power system under operation is mainly based on the dynamic security monitoring system, and it provides a strong technical support for the realization of the automation of the whole power system production process through the operation of the safety monitoring system. From the system structure, it mainly includes two important subsystems, one is SCADA system, the other is monitoring and control system. Although the operation mechanism of the two subsystems is different in each operation process, the automatic fault detection technology is the common innovation of the two. Through the detailed record of the electromagnetic transient, and then the targeted and purposeful analysis of the quality defects hidden in it, it can effectively promote the accuracy and effectiveness of the detection results, and can realize the synchronous transmission of two sets of data through the connection with the GPS technology, and promote the significant improvement of the efficiency of monitoring and maintenance<sup>[4]</sup>. In addition to the above functions, the dynamic security monitoring system can effectively solve the problem of data redundancy in the operation of the traditional fault recorder, and create favorable conditions for the improvement of the accuracy and applicability of the data. The specific operation process is illustrated in figure 1, the integrated automation monitoring system.



**Figure 1.** Electric power integrated automation monitoring and control system.

### 3.2 Intelligent control technology

In order to realize the network, automation and intelligentization of the power system in a real sense, it is necessary to expand the application scope and strength of the intelligent monitoring system from the intelligent monitoring system. At present, intelligent monitoring technology is one of the most widely used technology forms in the field of power system control technology. It is also the core technology of the whole electric power research work in our country<sup>[5]</sup>. Compared with the system or technology, the advantage of intelligent control technology is to effectively solve a series of complex problems that can not be dealt with in traditional control technology, especially in the system with higher requirements of nonlinear and uncertainty, and still can play its own excellent control effect, so it has a very broad application prospect.

### 3.3 Flexible AC transmission system

At present, the flexible AC transmission system in the whole automatic transmission system is one of the most critical contents, which covers a wide range of new technologies, including remote sensing, power electronics, microcomputer processing and sensing technology, besides, based on the original technology types of the system, an energy-saving technology adapted to the national green development is set up, for example, FACTS technology, series compensation, SVC technology and so on, realized the intelligent and automatic control of the core parameters of the transmission system. To some extent, it has created a good and stable operating environment for the operation of the transmission system. It not only promotes the power transmission efficiency and the controllability of the transmission system greatly, but also effectively reduces the actual cost of the power supply process and the waste of power energy, and helps to achieve a good transmission efficiency of transmission<sup>[6]</sup>.

### 3.4 Multiple integration technology

The power automation technology and the network information technology are unified and integrated with each other. Under this background, multiple integration technologies have emerged as the times require, and gradually become one of the main control technologies in the whole power system operation. Through in-depth research

and analysis of the technology, it is found that many integrated technologies have their own scientific and technical complexity in the practical application process, but it can analyze the actual demand of electricity users through this technological characteristics, through the analysis of the results, the user needs information is collected, and the whole huge data system is effectively collated, classified, processed and stored. Through the application of a number of integrated technologies, the speed of the power system and the improvement of automation efficiency can be effectively realized.

### **3.5 Simulation technology**

The wide application of simulation technology in the power system has established a relatively sound and perfect defense system for the system. The stability and security of the system are effectively guaranteed in the process of the system operation. It lays a good foundation for the smooth development of power automation. From the practical application of the simulation technology, it can be more scientific and reasonable to analyze and evaluate the operation status of the power system in an all-round way, and then formulate relevant maintenance schemes to improve the handling capacity of all kinds of power system production safety accidents<sup>[7]</sup>. In the process of the application of the simulation technology, it can realize the understanding and mastery of the state of the operation state of the power system according to the comprehensive data and the evaluation results, and then promote the further improvement of the controllability during the operation of the power system, and thus promote the effective development of the automation of the power system.

## **4. Future development trend of power automation technology**

### **4.1 Speed up the integration of GPRS Technology**

Through the situation of the existing distribution network in China, the low voltage distribution construction in the distribution network system is large, but the overall planning layout is too scattered, and the complexity and technology of the distribution equipment construction is added invisibly. To speed up the application of mobile GPRS technology in the construction of distribution network, even if the low-voltage distribution of the planned layout is very scattered, it can still complete the collection of effective data information and the monitoring of the operation of the distribution network, moreover, the multi monitoring data has high accuracy and timeliness, which fully meets the needs of modern power system for data transmission<sup>[8]</sup>. In addition, the perfect fusion of mobile GPRS technology and power automation technology realizes the intelligent adjustment of the power system, and can easily cope with the present complex power network system.

### **4.2 visual information**

The introduction of visual information technology in power automation system can be more comprehensive and comprehensive analysis of all kinds of image data, which is helpful to the rapid improvement of the function of the remote monitoring system and fully meet the development of modern automation. Through the statistics of the total demand for power automation, on-line monitoring and unmanned operation have become the main direction of the future development of the technology, such as the real-time detection and control of electrical switches in different circuits, to the maximum to achieve the purpose of saving human, material and financial resources.

### **4.3 Improve computer functions**

The application of computer technology in the power automation system, with the server as the carrier, realizes the communication and sharing of information between the server and the client, and greatly improves the actual working efficiency of the server and the client<sup>[9]</sup>. In the future, the power automation technology will develop in depth in the following two aspects. On the one hand, the long-standing electromagnetic compatibility problem existing in computer systems will be solved as soon as possible to avoid the hindrance of electronic interference to the implementation of technology and ensure the safety and stability of the entire system. On the other hand, efforts are made to improve

auditing techniques and fuzzy techniques, and to fully utilize the improved technology in the system, while effectively reducing the cost of investment, and further improve the unmanned control and automatic control objectives.

## 5. Conclusion

To sum up, with the continuous deepening of China's electric power system reform, electric engineering and its automation technology are actively introduced into the operation process of power system, breaking through the constraints of the traditional mode of power grid operation and fully realizing the level of automation in the whole process of the system operation<sup>[10]</sup>. With the continuous emergence of a large number of new technologies, such as visual information and GPRS technologies, it is necessary to speed up the effective integration of power automation technology and new technologies, and to maximize the development of the power industry, to realize the intelligent development of power system and ensure the sustainable development of the whole power system in the real sense.

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