

Exploring The Relationship Between Power System And Its Automation And Relay Protection

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Abstract: *The construction of power system projects plays an important role in the contemporary socio-economic development of China, which can meet people's daily electricity needs while promoting the stability of system operation. At present, China has begun to integrate automation technology into the construction of the power system and improve the rationality of power resource transmission through relay protection mechanisms. When applying relay protection in practice, it is necessary to take the relationship between the power system and its automation and relay protection as a prerequisite, so that it can play a substantive role. The article mainly discusses the practical application of relay protection by analyzing the characteristics of power systems and their automation and their relationship with relay protection.*

Keywords: Power system; Automation; relay protection.

1. INTRODUCTION

The application of automation technology in the power system can promote more intelligent transmission and configuration of power resources, meeting the needs of China's current power industry development. Relay protection is an important component of the power system. Although it can promote the development of the power system and its automation, it also has certain constraints. To fully utilize relay protection, it is necessary to clarify its relationship with the power system and its automation, providing effective guarantees for the stable operation of the power system. In fact, the power system is a very complex system form, but its structure is relatively simple. The power system and its automation have led to a transformation of the traditional composition mode of the power system, where redundant structures have been removed, allowing the power system to reflect the characteristics of a simple system structure during operation. It is precisely this simple system structure that reduces the difficulty of operating and managing the entire system, while also improving the effectiveness of power resource management. At present, people have a high demand for electric energy, and in the process of regional economic development, more and more people are starting to need to use more electricity to meet the rich demand for daily electricity. The embodiment of automation technology in the power system can promote the operation of the power system.

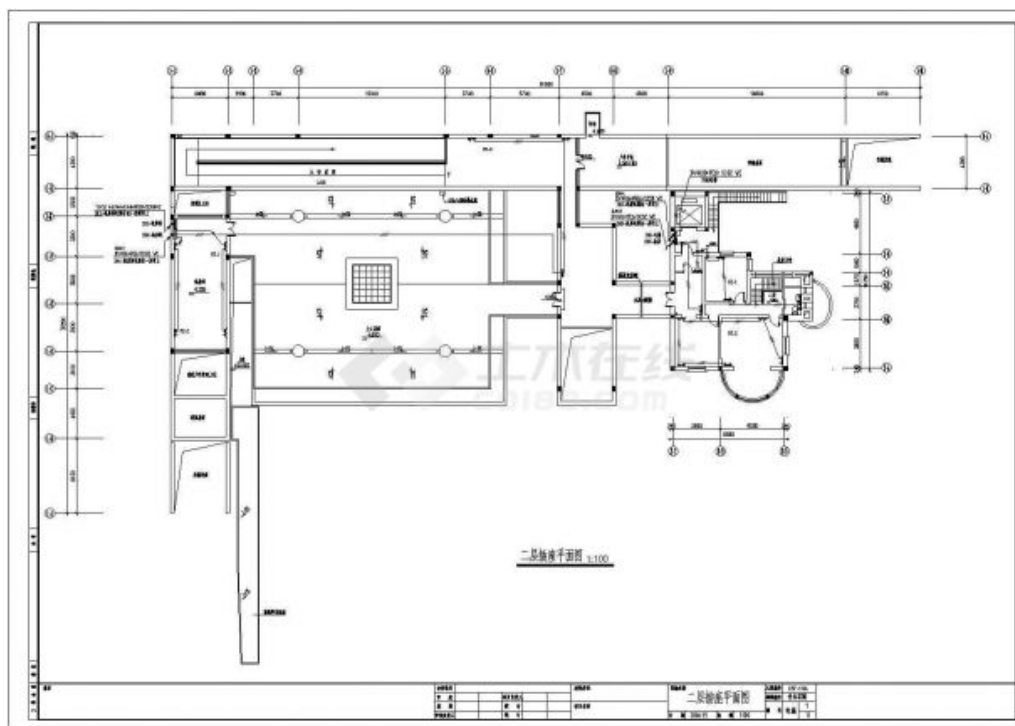


Figure 1: Power System Design Drawing

Line operations demonstrate the value of integration. The power system and its automation can utilize computer technology to form an integrated power system control center. Once faults are found, they can be promptly addressed to alleviate the pressure on staff and reduce operating costs. In this situation, power companies can create a favorable profit atmosphere, obtain more

profits, and promote sustainable development of the enterprise. However, the design of the power system and its automation is relatively complex. Although the overall structure related to the specific stroke is relatively simple, many design drawings are still complex and prone to problems. Figure 1 shows most power system design drawings, indicating that the overall design still needs to meet a lot of requirements in order to meet the requirements of system application.

2. THE RELATIONSHIP BETWEEN POWER SYSTEM AUTOMATION AND RELAY PROTECTION

2.1 Power System Impact Relay Protection

Relay protection is widely used in power systems, and many power companies use relay protection measures to improve system safety and generate significant economic benefits during the construction of power systems. Especially in the process of development in the new era, many industries in China are developing towards informatization, intelligence, and other directions. In this development trend, the power industry has already achieved the integration of power system control and protection. In the process of utilizing relay protection, many protection devices are mainly based on transformers and generators, which can prolong the service life of power equipment. However, in the actual use process, it is still necessary to adjust the relay protection device based on the actual operation of the power system. When highlighting its maintenance role, it is necessary to conduct a thorough investigation of the power system in order to enable the relay protection device to play a substantive role. Therefore, the power system will to some extent affect relay protection.

2.2 The stability of relay protection operation is affected by the automation of the power system

During the operation of the power system, it is necessary to ensure its own stability in order to operate normally, provide people with power resources, and ensure their normal lives. In the current era of rapid development of science and technology, the application of automation technology in the power system has become inevitable. However, to truly achieve power system automation, it is still necessary to effectively utilize relevant technologies and equipment to improve the overall level of power operation. As an important component of relay protection, the power system needs to fully reflect the effectiveness of internal equipment, while utilizing automation technology to achieve the transformation and upgrading of relay protection. During the automation operation of the power system, relay protection will still be affected to a certain extent, resulting in poor overall system stability. The main reason is that the integration speed of some power system automation technologies is relatively slow, making it difficult to fully play its fundamental role, and there may be a possibility of causing faults. So, when strengthening the stability of relay protection, it is still necessary to ensure the scientific application of power system automation in order to have substantive effects.

2.3 Relaying protection and power system automation transformation related

In the power system, there are information control systems, whose main function is to control and process electrical energy. During the process of providing electrical energy, the transmission form of electrical energy can be analyzed and controlled. In the process of producing electricity, it is also possible to use power system automation to carry out related regulation and control work, which can be met to a certain extent for people's increasing electricity demand. When layering and grading the electrical energy transmitted by the power system, it is necessary to classify the original electrical energy. It can be processed in order to regulate the original electrical energy. In the entire system, relay protection needs to be associated with the automation transformation of the power system to ensure the stability and safety of power transmission, and reduce the problems generated during system operation.

3. APPLICATION OF RELAY PROTECTION IN 3 POWER SYSTEMS

3.1 Generator protection

The application of relay protection in power system automation is reflected in the form of relay automation technology, mainly focusing on generator protection and playing a role in two forms: key protection and backup protection. In the process of key protection, once a short circuit occurs between the turns of the generator stator winding, the insulation layer at the temperature rise position of the generator will be affected to a certain extent, resulting in difficulty in normal operation of the generator. After implementing relay protection, a protection device can be installed between the stator winding turns to determine the stability of the generator stator winding turns. Backup protection mainly refers to the use of relay protection devices to cut off the power supply when the stator winding load of the generator is low, and at the same time, it can issue warning signals to inform management personnel of the specific situation and conduct inspection and maintenance.

3.2 Bus protection

The relay protection forms of busbar protection in the power system and its automation mainly include comparative protection and differential protection, providing guarantee for the stable operation of the power system. The application of comparative

protection in power system relay protection is relatively limited, and many power systems use differential protection as the main form of protection. Differential protection is the installation of current transformers in bus components. If the current is small and grounded, the system bus protection can be used to keep the two phases connected. Some staff will also lower the connection of two windings at the side end of the bus, which requires the use of three-phase connections and relay protection measures in the relay protection device to meet basic work requirements and improve the safety of power system operation.

3.3 Transformer protection

There are many forms of transformer protection, mainly including short-circuit protection, gas protection, and grounding protection. The main function of transformers in the power system is to convert voltage. Due to their large workload, they are prone to many problems. Therefore, the above three forms of relay protection can be utilized. When implementing short-circuit protection, two forms can be used: overcurrent protection and impedance protection, which can improve the short-circuit phenomenon generated by transformers. Gas protection analyzes the focus of transformer faults, and after the oil tank ruptures, gas protection can be activated to cut off the power supply. Grounding protection is quite common in power systems and their automated relay protection. Technicians can use zero sequence current protection to achieve this transformer protection content, and set zero sequence protection on both sides to improve the comprehensive protection effectiveness.

3.4 Line grounding protection

The lines in the power system are generally relatively complex. In order to facilitate the differentiation of different lines during system operation, the implementation of relay protection can be divided into two types of current grounding: large and small. If a high current is selected, it is necessary to cut off the power supply to avoid ground faults that may affect the normal operation of the system. When the system is at zero sequence power and a ground fault occurs, it is necessary to change the direction. If the system can still maintain stable operation without generating faults, zero sequence voltage will generally not be generated. System maintenance personnel can inspect and analyze this situation, Check if there is a ground fault inside the system to ensure its stable operation.

4. CONCLUSION

The power system and its automation interact with relay protection, and the application of automation technology in the implementation of relay protection has become a trend in industry development, which also plays a significant role in the stable operation of the power system.

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