Analysis of Power System Security and Prevention Measures Based on Risk Internal Control

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Abstract: Safe and sTable power system is an important condition to ensure people's quality of life and safety of life. It promotes the modernization of China's economic construction to a great extent and maintains the social stability of China. The security and prevention measures of power grid are important guarantees for economic development and social stability. This paper briefly introduces the security problems of power system and the principles and classifications of current security evaluation of power system. Then, from the analysis of the internal factors and external factors that affect the safety of the power grid, combined with the current technology and management methods, the paper puts forward some preventive measures to strengthen the safety of the power system and prevent large power outage accidents in the power system. Power system is often interfered with by various factors during operation, which affects the safety of the system. It is necessary to strengthen the assessment of the safety of China's power system to ensure the safe and sTable operation of the power system.

1. Introduction

This paper starts with the definition of power system security, and briefly describes the classification of power system security, safety evaluation principles and evaluation classification, and on this basis, puts forward some measures for power system security prevention and control [1] . In recent years, power grid accidents have appeared frequently, which not only brings a large degree of economic losses to power companies, but also poses a threat to their safety. Therefore, ensuring the safe, economical and sTable operation of large-scale power grid systems has become a top priority for power supply companies [2]. However, due to the influence of the power system's own factors and external interference, power system accidents have occurred, which not only causes huge losses in the economic benefits of the power transmission and distribution enterprises, but also has a serious impact on power users and the whole society. The basic precondition for the safety of power systems is the stability of the power system [3]. Generally speaking, the security of the power system is the ability of the power system to withstand various disturbances and faults in the normal operation process. Power system security has many evaluation indicators, such as voltage stability, system decoupling, power angle stability, frequency stability, thermal overload and so on. China will form a huge national interconnected power system. If there are serious accidents in the power system, its scale and losses may increase substantially [4]. Therefore, to ensure the security, stability and economic operation of large-scale interconnected power systems is a major and urgent problem, which must be solved as a major strategic issue.

Electric energy has become an indispensable part of human daily life. Nowadays, the demand and dependence of human beings on electric power are more and more intense, so the demand for power supply security is higher and higher [5]. With the rapid development of the world economy, people's demand for electricity is expanding day by day. The safe and sTable operation of power grid is becoming more and more important to economic development and social stability. With the increasing demand and dependence on electricity in various countries, large-scale interconnection of power grids has become an important feature and ineviTable trend of power system development in various countries [6]. With the development of social economy, the progress of science and technology and the continuous improvement of people's living standards, people's demand for and dependence on electricity is growing, and the demand for safe and sTable power supply is

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becoming stronger and stronger [7]. However, due to the influence of the power system itself and external interference, grid accidents occur sometimes, which not only causes the economic benefits of the power management enterprises to be lost, but also has a serious impact on the power users and the whole society. The security of power systems can be generally divided into two types: power system dynamic security and power system static security [8]. Among them, the static security of the power system can be divided into five categories: crisis state, normal state, recovery state, warning state and emergency state according to the satisfaction of various parameters.

2. Factors affecting power system security issues

2.1 Internal influence factor

The internal influencing factors of power system security problems are mainly manifested in the failure of power system components, such as generators, transformers, power line faults, etc. [9]. Protection and control of the control system failure, such as hidden faults of the relay, malfunction of the circuit breaker, obstacles in the operation. Computer software and hardware systems have failed; information systems and communication systems have failed, such as failure to communicate with EMS systems, control and protection, information system congestion, and external attacks or damage [10]. The purpose of safety evaluation of power system is to accurately judge and evaluate the hidden quality and safety hazards in the operation of power system, and to provide objective and reasonable basis for improving power system. In the process of security evaluation of power system, the principle of objectivity, scientificity, feasibility, comparability, conciseness, practicability and systematicness should be adopted to ensure the comprehensiveness, objectivity, rationality and efficiency of the evaluation. According to the Guidelines for Power System Safety and Stability, power system security refers to the ability of power system to withstand fault disturbances in operation, such as sudden loss of components in power grid, short-circuit fault and so on.

The method of power grid security evaluation is qualitative evaluation including quantitative factors, and the evaluation results do not give the specific probability of accidents. Instead, a quantitative analysis of certain security indicators is carried out, and the degree of power grid security is judged by the value of the comprehensive evaluation function of power grid security. Therefore, the type of power grid security evaluation is shown in Figure 1.

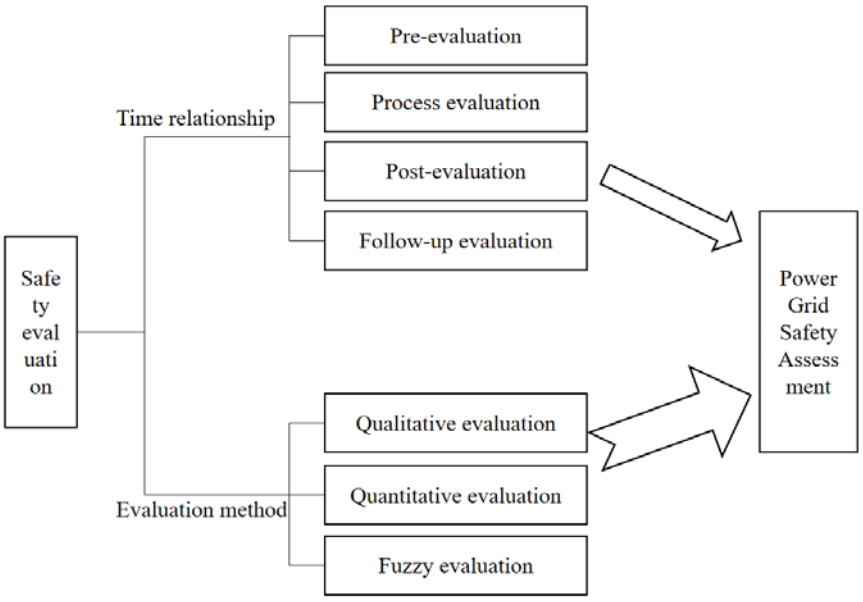

Fig.1. Classification of grid security evaluation

2.2 External influence factor

The external factors affecting the safety of power systems are divided into human factors and natural disaster factors. Human factors: errors in the operation of the operator, errors in the control

and protection system settings, and the deliberate destruction of malicious events such as terrorist activities. Natural disaster factors: earthquakes, forest fires, strong storms, floods, hail, etc. The traditional power system security is mainly in the event of a fault, studying the dynamic characteristics of the power system itself, including the power angle stability, voltage stability, frequency stability, system unwinding, thermal overload, etc. of the system. This kind of research is generally aimed at a single fault, while large-scale blackouts are usually complex sequences of cascading events. Generally speaking, safety evaluation methods can be divided into pre-evaluation, post-evaluation and follow-up evaluation according to the relationship between the time of power system evaluation process and the evaluation object. In the design stage of power system, the safety of the system is evaluated beforehand. The process safety of power system is evaluated during its operation. After a period of power system operation, the past state security evaluation is carried out. Tracking evaluation is the safety evaluation of tracking investigation after the power system is put into use in a certain period of time.

3. Effective precautions against power system security problems

3.1 Strengthen power grid construction

In recent years, the interconnection of power grids and the multi-infeed AC/DC hybrid transmission mode have emerged, together with the dynamic behavior of high-power power power electronic equipment which has great risks in operation. These characteristics affect the safe operation of power grid to a great extent. The purpose of safety evaluation is to accurately evaluate the safety performance of the target system, and the evaluation must be able to provide some reference and suggestions for the improvement and further development of the target system. In view of the power grid system, in the whole evaluation process, from the preparation of the original data to the analysis of the final evaluation results, scientific methods must be adopted to maintain an objective and impartial attitude. After a fault in one part of an interconnected power system, other parts of the interconnected power system are often unaware of the occurrence of the fault before the fault hits. Therefore, in an interconnected power system, unified grid management, unified grid dispatching, and establishment of a sound safety operation system are important conditions for ensuring the safe and reliable operation of the power system. In the power system, transmission equipment with long service life should be used as much as possible to reduce the quality of power consumption and safety hazards caused by equipment aging during power system operation. Old equipment that has reached the end of its useful life or is severely damaged in the power system should be replaced in time.

3.2 Strengthen monitoring and management

In order to ensure the safety of the power system, we should pay attention to and strengthen the monitoring and management of the power system. Because the modern power system makes full use of various pioneering technologies and means. Such as digital control technology, computer technology, etc., the entire power system realizes the sharing of power grid information resources, and can also rationally and optimally configure the resources of the power system to a large extent, and improve the operating efficiency of the power system. However, due to the high-efficiency interconnectivity of the power system, individual faults in the power system are likely to cause a chain reaction, resulting in a large-scale failure or even paralysis of the power system, seriously affecting people's normal power consumption. Therefore, unification should be implemented in the monitoring and management of power system, that is, unified power system scheduling and management. In order to strengthen the supervision and management of power system, regular training of power network staff can be carried out to improve their technical and self-accomplishment. The principle of practicability and conciseness should be paid attention to in the evaluation methods and the use of data. The evaluation method needs to grasp the main contradictions that can reflect the security of the target system, and use the simplest model and method to get the comprehensive and accurate security performance of the system as far as possible.

4. Conclusion

As the national infrastructure, power system is closely related to people's vital interests, such as production and life. We should strengthen the evaluation and prevention of power system security to ensure the sTable and efficient operation of our power system. By discussing and studying the security problems and preventive measures of power system, we fully realize some security problems existing in power system. By analyzing the influencing factors of power system security, a series of relevant preventive strategies with substantive significance are put forward. This paper first introduces the definition and classification of power system security. On this basis, it reviews the principles of power grid safety evaluation and the classification of evaluation methods. Then, the factors affecting the security of the power system are introduced from two aspects: internal factors and external factors. Finally, combined with the current research status and technical means, a series of measures to strengthen the safety of the power system and prevent and control the blackouts are proposed to fundamentally reduce the risk of grid safety.

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