Research on Improvement Path of China's Smart Grid Security Control

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Abstract. At present, China's smart grid construction has made great progress, and its safety control problems have gradually surfaced. Through literature review and investigation, this paper finds that the country's smart grid still has information interconnection, inadequate and unreasonable allocation of security resources, imperfect security control system and many security vulnerabilities. It proposes to build a complete smart grid information management system and increase intelligence. The improvement of the safety resources of the power grid and the improvement of the safety management system of the smart grid require the government to complete the work with the smart grid operators.

1. Introduction
The smart grid is a new type of power grid based on the physical grid, which integrates modern advanced sensor measurement technology, communication technology, information technology, computer technology and control technology with the physical grid. It achieves reliable and economical users for the purpose of fully satisfying users' demand for electricity and optimizing resource allocation, ensuring the safety, reliability and economy of power supply, meeting environmental constraints, ensuring power quality, and adapting to the development of power market. Clean, interactive power supply and value-added services. Smart grids have distinctive features that motivate users, information integration, and compatibility coordination.

At present, China's smart grid construction covers power generation, dispatching, power transmission and distribution, power distribution and user links, including: information platform, dispatch automation system, stability control system, flexible AC transmission, substation automation system, microcomputer relay protection, Distribution network automation system, electricity management acquisition system. In actual operation, there are still many hidden dangers of safety control in China's smart grid, and there is still a big gap between the goal of building a “strong smart grid”, which needs to be overcome and solved in practice.

2. Analysis of China's smart grid security control issues
At present, China's smart grid security control defects mainly include four problems: information island phenomenon, insufficient or unreasonable allocation of security resources, imperfect security control system and system operation security loopholes.
2.1. Information island phenomenon
The smart grid information system is a key part of ensuring the safe operation of the grid. It integrates multiple fields of expertise such as cloud computing, communication and data acquisition and processing. Since China's smart grid is built on the basis of traditional power grids, the information sharing facilities between the various subsystems of the smart grid are insufficient, and the information leakage of each other is reduced while the security control deployment becomes fragmented and fragmented. Horizontal information sharing and vertical information monitoring has great difficulties. In the case that the subsystem information management is independent, it is difficult to ensure that the security control of the smart grid is effectively analyzed, monitored and maintained as a whole, and the overall security performance faces greater risks.

2.2. Insufficient or unreasonable configuration of security resources
At present, China's smart grid operation is gradually moving towards automation and unmanned, which has great benefits for saving operating costs and improving the scientific level of grid operation. Some power operation units have insufficient safety resources and are not well-configured, including necessary monitoring equipment, human resources, security burglary, fire alarm and equipment failure handling procedures, and lack of special personnel responsible for alarm information processing. These situations lead to the inability of the smart grid to be dealt with in a timely manner, and it is difficult to implement accountability after a security problem or failure.

2.3. Inadequate safety control system
China is a vast country with diverse climates and topography. Adapted to the complex and varied environment of the operating environment, the types and types of smart grid safety facilities are quite different, and the safety system has many advantages. Therefore, the construction of the national smart grid security control system is a heavy and time-consuming task. At present, China's smart grid security control system is still not perfect. The performance is: on the one hand, the safety standard is not sound enough, and some standards lag behind the development of science and technology, which makes the construction and maintenance of related subsystems lack reasonable standards; on the other hand, decentralized The characteristics of management determine that China's smart grid is not efficient in the design, operation and maintenance of safety facilities and equipment, lacking overall construction planning and work plans. The inspection work is mainly based on qualitative management, and quantitative management is not enough.

2.4. System running security vulnerability that needs to be patched
Decentralized management of the smart grid also determines that there are many security vulnerabilities, and must be repaired in time to meet the technical operation and corporate social responsibility and legal responsibility requirements. The security vulnerabilities that the system runs mainly include: First, device vulnerabilities. In practice, reverse engineering analysis of smart grid equipment can identify loopholes in equipment. For example, use a variety of open source R & D and debugging tools to analyze a device in the smart grid, from shallow vulnerability testing to code layer analysis, and even decompilation and reverse engineering analysis. Such security holes in the smart grid are easily learned by lawless elements or organizations and are highly vulnerable to damage. Secondly, the hidden dangers of customer privacy leakage in the grid marketing end are more prominent. Because anyone who can view the user's electricity data can grasp the activities happening in the user's home through the smart grid, track what the family members are doing in their home, including whether they are on vacation or at work, and the user's behavior pattern is easy. Analyzed by an individual or organization that is ill-intentioned.
3. Improvement path of China's smart grid security control
The improvement path of China's smart grid security control mainly includes the construction of a complete smart grid information management system, the increase of smart grid security resources investment and the improvement of the smart grid security management system.

3.1. Building a complete smart grid information management system
Abandon the traditional management thinking of segmentation, build a comprehensive smart grid communication information management system nationwide, realize the interconnection of information, and break the existence of “Information Island”. A complete set of smart grid information management system requires strong self-repair ability, and has high information transmission efficiency in power generation, transmission, substation, power distribution, power consumption and power dispatching. We can consider combining smart grid construction with dedicated communication network construction, implementing the overall goal of safety control in construction planning, initial design, project construction and operation and maintenance, strengthening the application of grid data collection and information processing, and improving intelligence. The overall efficiency and effectiveness of grid operations.

3.2. Increase the safety resources of smart grids
To ensure the safe operation of the national smart grid, a modest increase in resource input is a must. The first is to increase the necessary manpower and equipment facilities to enhance real-time monitoring of the smart grid. Real-time monitoring of transmission and distribution lines of various voltage levels of the smart grid by means of Internet of Things technology and a new generation of 5G communication network technology to scientifically and rationally optimize the operation status of the power grid; strengthen evaluation and analysis of operational data of relevant safety facilities and equipment, and further enhance Safety capabilities and smart grid operation reliability. For example, combined with the actual development of scientific IP network, IP video and IP storage integration IP surveillance solutions, comprehensive consideration of smart grid in multi-level network calls, platform open, SCADA linkage and other series of value-added service requirements, The solid grid monitoring system achieves a solid foundation for the realization of unattended targets. Secondly, to establish and improve the hidden dangers and fault handling mechanism of smart grids, we can consider the use of remote control technology to optimize the safety hazards and fault handling procedures, clarify the safety responsibilities of each operation and maintenance unit and individuals, and improve the safety control work level.

3.3. Improve the safety management system of smart grid
A sound smart grid safety management system is essential for the efficient and safe operation of China's smart grid. First of all, it is necessary to make provisions on the relevant norms for the construction, operation and maintenance of smart grids at the legal and administrative levels. Under the legal and administrative framework, relevant industry associations are guided to participate in the development of a series of applicable normative standards by the relevant parties of the smart grid to facilitate the implementation of security control at the national level. The second is to strengthen the security cooperation between the State Grid, China Southern Power Grid and other local power grid entities. The decentralized security management is a unified security management, which helps to improve the security control level of the smart grid. Once again, it is to establish and improve the smart grid vulnerability patching mechanism, timely fix security loopholes from the perspective of technology and management, and formulate privacy protection rules for smart grid users to ensure that the user data involved in the smart grid is used safely and legally.
4. Conclusion
China’s smart grid construction is large and fast. The government and the power market operators should play their due role in this great process, and jointly provide users with better policy norms and better quality control services to ensure intelligence. The grid meets the needs of society and users.

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