Application and Research of Power Information Communication Technology in Smart Grid

Peng Chen*, Shiwen Chen, Wei Zhong, Jinglin Zhou, Qizhi Zhou, Chao Liang, Zeya Fang, Xiaobei Wang
State Grid Hubei Electric Power Co., Ltd. Huanglongtan Hydropower Plant, Shiyan 442000, China

*Corresponding author Email: Chenpeng2019@126.com

Abstract. Under the background of intelligent power grid, the rational application of information and communication technology can fully improve the quality of construction and management within the system. In the era of smart grid, workers in related fields need to more clearly define the application characteristics of information and communication technologies, rationally plan the application of information and communication technologies in new energy fields, power transmission and distribution, and power consumption, and improve information and communication technologies. The application efficiency optimizes the modernization and development level of information and communication technology.

1. Introduction
The application of power information technology in smart grid has very important practical significance. Whether it is applied in the field of electricity, application in the field of transmission or application in the field of power distribution, power information technology plays an important role. The irreplaceable role, through the application of power information communication to improve the level of smart grid services, to meet the growing demand for electricity for the majority of electricity users, has become the core and key to the construction of smart grid.

2. Related concepts of power communication technology and smart grid
2.1. Power Communication Technology
Power communication runs through most of the content and links in the power system, and plays a very important role, which plays a role in guaranteeing the service of special communications. From the production to the use of electricity, there are many links and steps are complicated. Therefore, centralized scheduling and coordinated management are needed to ensure the scientific and rationality of power production, operation, transmission and use. Its economic goals and safety goals. In order to achieve this, a cooperation of the power communication system is required [1]. There is a common point between power grid and power communication. The two have mutual support and dependencies on the service objects and basic structure. It can even be said that there is a very close relationship between power grid and power communication [2].
2.2. Smart Grid Technology
The specific content and related links of power system from power generation, power generation to electricity and power transmission are the research contents of smart grid. The purpose is to control the power grid and promote the development and application of new information technology, and combined with the actual situation, all relevant technical content is integrated and summarized to promote the automation and intelligent realization of various functions of the power system. At present, the construction and development of smart grid is one of the core objectives of power companies [3]. Through the effective integration of advanced technologies with various levels and various types of businesses, the economic benefits of enterprises can be improved. Security is the core requirement and basic function of the smart grid. In order to ensure the stability and balance of the grid system operation, the hardware and software of the smart grid have high requirements, which is especially evident in the operational response capability [4].

2.3. Connection between smart grid and power communication
The development of smart grid is an important driving force for the modernization of power companies, and power communication has a very positive significance in the construction of functional power grids. It is vigorously promoting the construction of smart grids and promoting the innovation of power communication technologies. The basic approach and effective protection. With the deepening of the modernization of the power industry, power companies are holding on to the construction and development of smart grids, and they also pay attention to the development of power communication technologies [5].

3. The role of power communication technology in building a smart grid

3.1. Promote the diversification of smart grids
Since the smart grid needs to meet the different needs of users, it requires a variety of functions of the power communication system. The effective combination of power communication technology and artificial intelligence has improved the development speed of smart grid and the application level of smart grid. The establishment of a diversified power communication platform can help the versatility of the smart grid, and utilize the standardized mode of communication to facilitate information transmission.

3.2. Providing confidentiality functions for smart grids
The smart grid incorporates advanced communication technologies that combine the advantages of software while increasing the risk of data breaches. By perfecting the power communication technology and encrypting the communication link, it is possible to prevent the power grid from being interfered by the outside world.

3.3. Increase the coverage of smart grid
The power communication technology provides technical support for the entire power grid. Through research on the corresponding technologies, the service scope of the communication technology can be increased, the perfect transmission of the communication technology can be ensured, and technical support for the complete coverage of the smart grid can be provided.
4. Development status of information and communication technology in the era of smart grid

4.1. Communication Network Technology
As the main body of national economic development, in the process of faster and faster economic growth, national power technology has undergone profound changes in recent years. The scale and coverage of information and communication networks have gradually expanded, and the volume and level of development of power communication have also been greatly improved. In modern planning and design work, network communication technology can be organically integrated with other kinds of communication technologies. Under the ever-increasing environment of power system communication development, network communication technology can significantly improve the scientific level of power management activities, and effectively enhance the operation and detection capabilities of communication networks.

4.2. Optical fiber communication technology
Optical fiber communication technology is also an important communication method for modern power system information and communication technology. This method mainly uses optical fibers as a medium for transmission of different signals. In the modern information and communication field, optical fiber communication technology has a high level of security development, and has the advantage and characteristics of greater carrying capacity. Applying this information technology to the production and living fields of modern society can fully realize its usability value.

4.3. Intelligent device technology
Intelligent device technology in information and communication technology is a very important information communication technology that has been developed since the power system. In the field of modern power information and communication technology, the application of intelligent power grid can provide powerful power support for the rational application of distributed energy and new energy. The application of power system network science and technology can achieve the goal of saving energy and reducing consumption. The intelligent networked information communication technology and optical transmission technology can be combined to build a more intelligent optical fiber communication technology network and improve the application efficiency of power information communication technology.
5. Application Analysis of Power Communication Technology in Smart Grid

5.1. Identify the characteristics of ICT application

Compared with the traditional power system power distribution network, the smart grid using power information communication technology can achieve economic security, energy saving, high efficiency and stability by means of a highly integrated communication management method, combined with measurement and control technology and sensor network technology. The grid is running. In the process of optimizing the application strategy of information and communication technology in the modern smart grid era, it is necessary to focus on the following three aspects of power information communication technology:

5.1.1. High compatibility. Among the modern smart grids, the rational application of power information and communication technologies is mainly to integrate various modern types of modern network information technologies. This technology can exhibit high compatibility characteristics in the actual application process, and can integrate a variety of different information technologies into the processing of grid data. In this way, it can fully meet the diverse grid usage requirements and system detection requirements.

5.1.2. Strong perception. In the process of applying electric power information and communication technology to the intelligent power grid, the real-time detection is completed mainly through the power grid sensing capability. This method can rationalize the operation parts and state parameters of each link in the grid system. And, through the way of analysis and processing, security assessment is achieved. In the actual planning and design process, if an abnormality occurs inside the system, the power information communication technology can help the system start the relevant abnormal processing procedure, complete the abnormality diagnosis alarm of the power grid itself, and isolate the relevant parts, and With the use of spare parts, the actions are completed, and finally the intelligent grid can be maintained at a high level of safety during actual operation and use. At the same time, an abnormality occurs inside the system.

5.1.3. Strong security. In the power supply and distribution management network of the power system, both the power generation enterprise and the power user have real-time monitoring and query
requirements for the data in the power grid. In this context, information such as the amount of electricity used in the grid, user data, and the user's electricity bills need to be closely monitored. With the gradual deepening of the intelligent network system, the degree of openness of the relatively independent network system has gradually deepened. In this link, the application of power information and communication technology will gradually deepen, satisfying the security retrieval and transmission requirements of many different types of data, and ensuring that data will not be lost or invaded during transmission.

Figure 3. Application of power information and communication technology

5.2. Rational planning of information and communication technology application path
The operation of the power platform must ensure that the various needs of the users are met. The existence of power communication is the process of helping to realize the intelligent power grid, and is also the guarantee for realizing the construction of an intelligent power platform. The smart grid combines with the power communication platform to enhance its technology and better serve its customers. After clarifying the application characteristics of the power information communication technology, it is necessary to further rationally plan the application path of the technology.

5.2.1. Application of power communication technology in new energy. In the current natural world, energy can be divided into two types, one is renewable energy and the other is non-renewable energy. Since the introduction of intelligent technology in the power industry, it has completely changed the traditional power system to non-renewable energy. Consumption, the operation mode of the smart grid is very in line with the concept of sustainable development strategy of power companies, so we say that our country is very supportive of the development of smart grid. The smart grid has a very big advantage, which is to help the power industry's power system to effectively use renewable energy in nature to generate electricity.

5.2.2. Application in power generation. The application of smart grids in the field of power generation is mainly used for reporting on water conditions, scheduling of storage capacity, and trading in power markets. It also plays a role in new energy and related control work. The development and use of new energy sources is inseparable from the support of power information communication systems, using intelligent information technology to complete interfaces and adjust voltage, power and quality. Ensure that the parameters of various technologies can be transmitted at high speed and accuracy. In addition, the power information system can also ensure the normal start and stop of new energy power generation,
control its power and related equipment, and actively play its important role. The smart grid will drive the power generation field to develop better.

5.2.3. Application of distribution network. The important component of the power system is the distribution network. The realization of the high efficiency, stability and flexibility of the smart grid is achieved by means of the distribution network. By adding new sensing technologies and information identification technologies to the distribution network, faults in the power supply network can be discovered in time, and automatic emergency treatment can be made. In addition, the full use of power communication technology in the smart grid can enhance the compatibility of the distribution network and optimize the power supply system to make it multifunctional.

5.2.4. Application of substation network. The intelligent network needs to realize the conversion of electrical signals, so the last link before the user obtains the electrical signal is the substation network. In order to realize the function of controlling power signals, the smart grid is often equipped with data detection facilities. Data monitoring includes three parts: information, sensing and intelligent identification. Through the cooperation of intelligent facilities, network equipment and information systems, data is transmitted to the control center, and commands from the control center are accepted to achieve efficient operation of the smart grid.

5.2.5. Application of transmission network. With the development of information technology, how to realize the transmission of long-distance and large-capacity power under the premise of low power consumption is a challenge for smart grids. The concept of environmental protection, the emergence of new types of electric energy, requires the optimization of distribution networks across regions to make them compatible with renewable energy. Therefore, the power industry needs to detect the transmission capacity and status of the network, and ensure the stable transmission of the power system through actual data. For example, adding a power communication identification device to a transmission line can monitor the operation of the power grid and the use of the terminal, and then provide a reference for adjusting the transmission line.

5.2.6. Application in the field of electricity use. In the intelligent power grid planning and design, the power user is the terminal of power transmission. In the actual management process, the staff should properly apply the power information and communication technology to properly cope with the diversity characteristics that appear in the system. In addition, in the effective processing, supervision and regulation of data information, staff also need to rely on power information communication technology. The establishment of an efficient power system communication network can achieve centralized collection and processing of large-scale information data, and optimize the interaction between users and grid companies.

5.3. Suggestions for improving the application of power communication technology in smart grid

5.3.1. Realizing the integration of existing communication systems and new energy power networks. With the improvement of the public culture level, environmental protection has become a trend, and the clean energy of the power system has received more and more attention. Therefore, renewable green energy is bound to become the main source of electricity in the future. Therefore, it is necessary to strengthen the compatibility of existing power networks while controlling waste discharge, and strive to find a coexistence model to promote smart grid while responding to environmental slogans. Sustainable development.

5.3.2. Widening the source of funds for the smart grid. Whether it is a power generation enterprise or a smart grid, it is inseparable from the investment of funds. To a certain extent, the investment of funds determines the output of income. Due to the relative complexity of smart grids, financing channels can
be expanded to fully utilize the advantages of the market economy and attract the input of funds to provide financial support for the development of smart grids.

5.3.3. Improve the security of the smart grid. There is a large amount of data in the smart grid, and there is a risk of leakage. Encrypting the data can improve the anti-attack capability of the grid.

5.4. Future development of information and communication technology
In the future development of information and communication technology, more network technologies will be added to it. Currently, 5G technology is the main support, and the power load management resources are fully utilized to build a platform with ultra-high speed and two-way communication. At the same time, more to add the corresponding supporting measures, such as patrol platform and marketing.

The rapid expansion of intelligent power grids continues to grow and develop. In the future development process, more attention needs to be paid to optimizing the structure of the network. The proportion of various types of communication methods should be mastered and rationally proportioned; information security work should pay more attention to and strengthen Protection, for the future development, information resources are very important, and effective measures are taken to protect them.

Figure 4. Application of power communication technology in smart grid

6. Conclusion
In summary, the smart grid is an inevitable choice for the development of power systems. Power companies continue to build intelligent, intelligent, information, scientific, and secure grids. In order to better achieve this series of goals, we should pay more attention to the development of information and communication technologies. In short, the development of smart communication information technology is inseparable from the overall operation status of the power grid. It plays an important role in improving the stability and safety of power operation. It attaches great importance to the practical application of power communication systems and exerts its application. Value.
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