Analysis of the Influence of Distributed Photovoltaic Power Station Grid Connection on Distribution Network Relay Protection

Zhilong Yin¹, Zhiguo Wang², Shuilian Xue³*
¹Xi'an Dynamic Inspection and Testing Co., Ltd, Xi'an, Shanxi, China
²Xi'an Dynamic Inspection and Testing Co., Ltd, Xi'an, Shanxi, China
³Chang'an District branch of China Construction Bank Co., Ltd, Xi'an, Shanxi, China
*Corresponding author’s e-mail: shuier_219@126.com

Abstract. With the improvement of China's economic level and the continuous development of the power industry, the current photovoltaic power supply has been welcomed by more and more users as a new type of energy in the power field. For the power generation field, it can promote the power resources Production and development. Since the implementation of the distributed photovoltaic power plant grid connection in my country, it has also had a large impact on the relay protection of the distribution network. This article has analyzed this.

1. Introduction
As far as the current situation is concerned, photovoltaic power is at the forefront of the times and is an advanced power technology. Photovoltaic power generation can use renewable energy such as solar energy to produce electrical energy. The process is green and environmentally friendly and will not cause harm to nature. It meets my country's current requirements for power development. This power technology has also been gradually put into the power application process of various power plants, and is regarded as the highlight of my country's power development. The establishment of distributed photovoltaic power station grid connection can better realize the application of relay protection in the distribution network relay protection in power applications, and it is also conducive to the development of distributed photovoltaic power stations and other measures to provide convenience for more people.[1]

2. Overview of technologies related to grid-connected control of distributed photovoltaic power plants

2.1. Several characteristics of grid-connected distributed photovoltaic power plants
If you want to fully understand the grid-connected technology of distributed photovoltaic power plants, it is not generalized. The macro analysis is not rigorous, and you need to analyze and discuss from specific characteristics. For the characteristics of distributed photovoltaic power generation, it mainly includes the following points: First, the transmission power is small, and the distribution range of transmission is uniform. Generally speaking, distributed photovoltaic power plants do not need to bear excessive electrical loads, and the normal distribution capacity is about several kilowatts.[2]
Compared with the previous centralized power station, the centralized power station in the past has a large power generation capacity, a high total power, a high electrical load, and a low power generation efficiency. But for distributed photovoltaic power stations, although the total transmission power is not high, the distributed power station structure is conducive to improving transmission efficiency. The construction scale of distributed photovoltaic power stations is more flexible and has little effect on the overall power generation efficiency. The economic benefits brought by it are hardly affected by scale, and can be constructed according to the needs of enterprises or social capital. Second, unlike previous thermal power plants, distributed photovoltaic power plants appear cleaner during power generation, have zero pollution to the environment, have better environmental performance, and will not destroy the ecological environment of nature.[3]

In addition, compared with the traditional thermal power generation process, photovoltaic power generation will not generate noise during the power generation process, which will affect the outside world. Since solar power generation is used, there is no need to worry too much about energy reuse and improve energy efficiency. Distributed photovoltaic power generation complies with the development concept of green and environmental protection. Thirdly, distributed photovoltaic power generation can take care of some areas with insufficient power supply due to the wide distribution of power stations, properly alleviate the situation in power supply, and solve related problems. However, due to the low transmission power of distributed photovoltaic power generation in the process of power generation, there is no timely installation of photovoltaic power generation related equipment for housing construction in some areas. This can only be a temporary countermeasure. Detailed analysis. Fourth, power transmission and production can be carried out at the same time. Most of the traditional power stations directly connect the power generation line to the transmission grid, so that the power can be transmitted and then generate power through other facilities. However, the application of distributed photovoltaic power generation in the distribution network can enable the power transmission and the production of electrical energy at the same time, and the two do not interfere with each other. Distributed photovoltaic power plants can be widely used in the development of electric power because of their remarkable characteristics and obvious advantages.[4]

![Figure 1. Structure diagram of distribution network of photovoltaic power station grid connection point](image)
2.2. The connection method of the grid-connected system of the distributed photovoltaic power station in the distribution network

In the process of applying distributed photovoltaic power plants to the distribution network, there are generally the following connection methods: The first is a special route connection. This is also the most widely used connection method in distributed photovoltaic power plants. As the name implies, it is to design a control switch at the starting position of distributed photovoltaic power generation, and connect the distribution network at the other end. The propagation speed is controlled to ensure the rationality of power transmission. The second way is to merge access circuits after splitting, also known as "T" connection. Unlike the first method, there is no need to set a general control switch at the starting position of the photovoltaic power plant, and a node that can be used for power control is created between the grid-connected system of the photovoltaic power plant and the distribution network, so as to achieve the overall power grid control.[5]

3. Research on the configuration of distributed photovoltaic power station grid-connected system for distribution network relay protection

When the distributed photovoltaic power plant grid connection system performs relay protection on the distribution network, it can be implemented in several ways. First, the anti-time protection method, this method is mostly used for power plant motor protection, reactor protection and protection of user distribution lines. The general meaning of inverse time protection is: when the motor or circuit fails, the larger the fault current, the smaller the action delay time for the relay protection. In general, the relationship between the fault current and the action delay time is inversely proportional. Second, by automatically cutting off the bus: Most distribution systems contain two buses. In the normal power generation, distribution and transportation links, the two sections of the bus can play their own roles. Once a fault occurs in the circuit, the bus will automatically cut off and stop the operation of the entire circuit. By measuring the voltage of the two busbars at different locations, you can find out the problems in the circuit. When the problem is eliminated, the busbar automatic cutting equipment will return to the original state. In order to ensure the stable operation of the circuits in the overall distribution network.[6]

4. Main influence of grid-connected distributed photovoltaic power stations on relay protection of distribution network

As far as the overall situation of the current distribution network in China is concerned, from the low-voltage distribution network used by users to the medium-voltage distribution network used by large enterprises, it is based on a single power supply. The main form of power supply is from a single power supply. The radial network formed, a distribution network formed by a single power source, from a technical point of view, the current direction remains unchanged, the current load fluctuation range is not large, the operation is not complicated, and the connection of the line is relatively simple. On the basis of this simple and simple power supply, in order to prevent accidents in the power supply process, my country has put forward a policy for relay protection of the distribution network. In the application process of the distributed photovoltaic power plant grid connection system, the original structure of the distribution network has been significantly changed. Through the support of various electronic components and the addition of related configurations of the photovoltaic circuit, the distribution network has become a single unit the simple grid structure has become rich in diversity, adding many new factors to the distribution network, and making the entire distribution network more interesting. In the original simple distribution network structure, instantaneous current quick-break protection, time-limited current quick-break protection, and time-limit over-current protection have been widely used by people, and can provide a good protection for the circuit.[7] However, after the structure of the distribution network is changed, the method of adding distributed photovoltaic power generation will affect the sensitivity of the protection measures when the circuit has a sudden situation in the current of the above circuit, and the protection effect on the circuit is greatly reduced, so when the distribution When a fault occurs during the operation of the
system, if the charge load is small, the impact is not large, and if there is a large current fluctuation, the probability of a safety hazard will be greatly increased. In other respects, most of the lines in China's distribution network are unidirectional power supplies, and there are simple devices for protecting the circuit. When the circuit fails, these power system protection devices will cut off the power supply at the first time to ensure power distribution. Safety of network circuit. After applying the distributed photovoltaic power plant grid connection system, if the power is cut off immediately when the circuit is connected, the current in the transmission is likely to re-enter the distribution network, resulting in the formation of a circuit directly connected to the electrical appliances in the distribution network. The circuit switch is automatically restored, which affects the safety of the overall distribution network.

In addition, in the distribution network circuit, need to install fuses for circuit protection. Once the current in the circuit is too large or the load is too large to exceed the range of the electric distance, the fuse will automatically cut off the circuit. Generally, the fuse is installed at the branch of the single-phase circuit or the trunk position of the entire circuit, so that the fuse can ensure the protection of the circuit from multiple directions. However, when the distributed photovoltaic power plant is connected to the network to protect the distribution network, the structure has undergone substantial changes. Connecting the original photovoltaic circuit to the circuit will affect the stability of the line and reduce the working sensitivity of the fuse.

5. Conclusion
With the continuous development of society, my country increasingly requires more new energy sources to be invested in power production to ensure the environmental protection of the overall power environment. Distributed photovoltaic power station, as an emerging power industry technology, meets the requirements of the times under the development of the power field, and is of great significance. Although it will affect the relay protection process of the distribution network, it needs continuous exploration and active innovation in the application process. Find relevant countermeasures to solve the problem, so as to better realize the relay protection of the distributed photovoltaic power station grid connection to the distribution network.

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