Fault analysis and maintenance of high voltage transmission line

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Abstract. In recent years, with the continuous expansion of power transmission scale, high voltage transmission lines also began to appear. We can see that high-voltage transmission lines provide security for social development, at the same time, we can not ignore its later maintenance and management work. In the operation process of high-voltage transmission line, it will be affected by various factors and prone to failure, which will bring a certain impact on people's life and production, and even directly threaten human life safety, health and property safety. High voltage transmission is a highly technical work, which is special in itself. If the technology can not keep up or the supervision is weak, it may lead to safety problems. External environmental factors will also significantly interfere with high voltage transmission. Therefore, it will focus on the analysis of high voltage transmission factors, operation characteristics and maintenance measures.

Key words: high voltage; transmission line; operation fault; maintenance.

High voltage transmission lines are different from ordinary transmission and transformation lines in that their structural parameters and voltage levels are relatively high. Most lines need to avoid urban areas to ensure their stable and safe operation. There is a positive correlation between insulator length and rated voltage of high voltage transmission line. The higher the two parameters are, the more likely to cause and aggravate environmental pollution. The most important problem in the construction of high voltage transmission line is the setting of towers. Too high towers usually lead to lightning, ice and snow more easily attacking the high voltage transmission line, increasing the difficulty of high voltage transmission line management and control and fault handling. Under the interference of its own characteristics, economic conditions and terrain characteristics, high voltage transmission lines usually have different types of operation faults.

1. Characteristics of high voltage transmission line

1.1. High voltage and heavy maintenance

The transmission distance of high-voltage transmission line is relatively long, and the terrain of the area covered is relatively complex. In order to minimize the loss of electric energy on the cable line, the voltage of the transmission line is boosted. Therefore, the transmission line has a relatively high voltage...
parameter level, which is much higher than that of ordinary wires. At the same time, the number of pieces, tonnage and longer insulators are used for transmission String. Therefore, maintenance increases a lot of workload.

1.2. Higher reliability and safety requirements
High voltage transmission line is related to the stability of power supply, at the same time, because it transmits high-voltage electricity, so its safety requirements are relatively high. In addition, because the high-voltage transmission line is carried by the tower, and the tower is much higher than the ordinary pole, and it is also exposed in the air, so it is easy to be affected by the external weather, such as lightning, ice Snow cover and other factors. In this environment, to ensure the stability of the power supply system, there are higher requirements for the reliability and safety of high-voltage transmission lines.

2. Operation fault analysis of high voltage transmission line

2.1. Human factors
Human factors are one of the causes of high-voltage transmission line failure, and human factors can be divided into two kinds, one is the intentional destruction of high-voltage lines, which is manifested in the behavior of illegal elements stealing, stealing high-voltage lines and other metal materials, or the behavior of stealing tower materials leading to high-voltage line failure, which will lead to damage to power equipment and lead to accidents There are various problems such as power failure. The other is due to the negligence of maintenance personnel in the maintenance of high-voltage lines, or refers to the high-voltage line construction personnel in the construction of high-voltage lines and other equipment, inadvertently damaged the tower of high-voltage transmission lines, or caused the high-voltage lines to drop, break and other fault problems. These human factors will lead to high-voltage transmission line failure, affecting the normal and stable operation of high-voltage lines.

2.2. External factors
External factors refer to natural factors. Because the high-voltage transmission line is installed on a relatively high tower, the height from the ground is relatively high, it is easy to be affected by natural phenomena, and lightning disaster is the main disaster. Due to the strong randomness of lightning disaster, it is difficult to predict the specific time and location of its occurrence, which is very complex. In recent years, the reason why high-voltage transmission lines can be easily disturbed by lightning is that the transmission distance of high-voltage transmission lines is too far and the area is very wide. In addition to the impact of lightning, it is also affected by strong winds, ice and so on, and the phenomenon of being covered by ice generally occurs in winter in the south, because in winter, the temperature in the upper air is very low, the humidity in the air is high, and then affected by the cold current, the high-voltage power line and the water droplets condensed on its surface will turn into ice. Once the high-voltage power line is covered by ice, it will be covered by ice Increase the weight of the whole cable. Once the weight of the cable exceeds the maximum weight that the two towers can bear, the tower will be forced to collapse and the high-voltage line will be disconnected, which will cause damage to the high-voltage transmission line.

3. Maintenance and repair measures of transmission line

3.1. Enhance the cooperation with relevant organizations, so as to improve the feasibility of maintenance scheme
In order to fundamentally avoid the adverse effects of bad weather on the line energy transmission, the transmission line department needs to communicate closely with the relevant agencies, and make reasonable planning for the line laying project with the help of the information and data mastered by the relevant departments. For example, it can enhance the communication with the meteorological department, comprehensively analyze the regional climate characteristics, and improve the feasibility
of the line laying scheme. For example, the distance between poles and towers can be reduced to avoid the adverse effects of bad weather on transmission lines, and create good conditions for the subsequent line maintenance work.

3.2. **Unify the line laying, maintenance and repair specifications, strengthen the regular professional training for the staff**

Because of the vast territory of our country, the geological conditions of various regions are very complex, and there are obvious differences. When carrying out the laying work of transmission lines, we can hire Regional Guides to guide the line laying. In order to achieve the standard level of the later line maintenance and repair, the most important thing is to prepare the line laying and maintenance standards, and implement the work in accordance with the relevant specifications, which can not only effectively reduce the use of cables, but also create convenience for the subsequent maintenance and repair work. Secondly, the professional level and comprehensive ability of the staff are closely related to the work effect, so it is also very important to carry out professional training for the staff, to ensure the professional ability of the staff, in order to ensure the smooth development of the work. In order to effectively improve the effect of training, we can choose the method of learning while practicing, so that the staff can effectively use the theoretical knowledge in practice, and can arrange the staff with strong work experience to lead the new staff to practice, so as to promote the improvement of the comprehensive ability of the staff.

3.3. **Strengthen the publicity of everyone's responsibility for the maintenance of transmission lines**

Because human operation will also have adverse effects on the line, so we need to carry out a comprehensive publicity of the transmission line protection work, so that people can establish the awareness of protecting the transmission line from the thought, so as to fundamentally avoid the damage caused by human factors to the line. Although China has a vast territory, the distribution of population in various regions is very uneven. Therefore, for those regions with sparse population, we need to use various methods to carry out publicity work on the protection of transmission lines, and organize leading cadres of various villages, counties and cities to carry out special study, so as to promote these management cadres to play a positive leading role in daily life and avoid accidents Stealing lines. The specific strategies are as follows. (1) Avoid bird gathering areas as far as possible. We should adjust the layout of the line from the line design standard and the local situation, and on this basis, we should avoid the line short circuit and other faults caused by birds as far as possible. (2) The birds in the area where the route is laid shall be managed by zones. That is to comprehensively analyze the living habits of birds, so as to introduce targeted protection and driving strategies. Especially in the areas where bird damage is relatively serious and wiring is necessary, effective bird driving measures must be introduced to prevent birds from long-term dwelling and nesting on lines, towers and cross arms. Monitoring, protection and maintenance of high-voltage lines are related to the rationality of insulator installation, the establishment of poles and towers, and the environment of line protection zone. It is necessary to comprehensively control any factors that will affect the transmission safety of high-voltage lines and eliminate the faults of transmission equipment in time. Ensure that the external factors will not damage the insulator, and quickly deal with the line fault, so as to prevent the line from "sick" operation to increase the scope of line fault.

3.4. **Power technology innovation**

Increasing power technology research and development and power technology innovation are the basic ways to improve the performance of lines and transmission equipment and extend their operation cycle. Small current grounding equipment is a new technology, which can effectively reduce the phenomenon of line short circuit caused by external factors, and provide effective guarantee for the stable and safe operation of power system. Automatic protection equipment also needs to be upgraded and replaced in time to enhance the security capability of new technology in the operation of high-voltage lines, and on this basis, comprehensively monitor the power grid system.
3.5. Improve the line facilities and equipment

Lightning, hail and other natural disasters will cause serious damage to the transmission line, so in order to reduce the damage of power line facilities caused by natural disasters as much as possible, we need to strengthen the protection and maintenance of the transmission line and facilities and equipment, and enhance the ability of the transmission line system to resist disasters. For those areas prone to lightning disaster, we can combine with the actual situation of the region, appropriately increase the anti-disaster equipment, and develop a special disaster emergency plan. Secondly, in areas with unstable weather, the frequency of inspection can be appropriately increased. Once problems are found, they can be handled in time, so as to reduce the harm of natural disasters to transmission lines.

3.6. Strengthen line inspection

The best way to reduce the loss is to take effective management measures before the occurrence of the problem and actively prevent the occurrence of the fault. Therefore, we must do a good job in the protection of the transmission line. According to the management regulations, the power transmission line shall be inspected and inspected regularly to understand the overall operation of the line, so as to find and solve problems in time; some special parts of the power transmission line or a section of the line shall be inspected, such as the line is located in a special area with special climate or terrain; Understand the cause and specific situation of the fault line, and carefully make the inspection record, so as to provide reference and maintenance experience for the inspection work.

4. Conclusion

The power grid is related to the national economy and people's livelihood, and the high-voltage transmission line is the bridge between the power grid and various users. It is of great significance to ensure the safety and stable operation of the high-voltage transmission line. Due to the special environment of open air, high voltage transmission line will be disturbed and affected by various factors. Only by adopting various effective maintenance means, can it ensure its stable operation and guarantee its reliability and safety. In order to ensure the normal operation of high-voltage transmission lines, it is necessary to study its maintenance methods in all aspects to ensure the stable operation of high-voltage transmission lines. Even if the high-voltage transmission line exists in the field environment, it can still operate normally, improve the safety of its operation, provide sufficient power support for people's life and production, promote social stability and development, and also improve the economic benefits of power enterprises.

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