Analysis of Influencing Factors of Transmission Line Operation Safety and Prevention Countermeasures

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Abstract. At present, the coverage of transmission lines is becoming wider and wider, and its environment is very complex. In bad weather, transmission equipment is prone to failure. However, in the process of transmission line operation, there are many influencing factors that have a great impact on its operation and inconvenience people's lives. Therefore, power grid enterprises will improve the safety of transmission line operation as the primary problem. This paper briefly introduces the operation of the transmission line, finds out the objective factors that affect it, and puts forward the prevention countermeasures, so as to improve the safety of the operation of the transmission line.

Keywords: Transmission line, operation safety, influencing factors.

1. Introduction
At present, most transmission lines have been affected by severe weather such as rain, snow and strong wind for a long time, which has caused serious damage to this line. There is also a part of the impact from human beings, because human beings destroy it, which brings serious hidden dangers to the safety of the line [1]. In order to ensure the quality of power supply, attention must be paid to the stability and safety of transmission lines, thus ensuring people's normal life. Therefore, it is of great significance to study how to improve the stability and safety of transmission line operation.

2. Brief Introduction to the operation of transmission lines
With the rapid development of science and technology, the technology of power transmission has been greatly improved. However, as people use more and more daily electrical appliances, the amount of electricity needed is also increasing. Therefore, the state has increased its investment in the power grid and expanded the scope of transmission lines. However, transmission lines are exposed to the atmosphere, which can't avoid the influence of natural weather and local environment. When external forces are generated, certain harm will be caused to transmission lines [2]. Therefore, we must strengthen the prevention and control of transmission lines, and take automation as a prerequisite to improve the safety of transmission lines. In addition, some monitoring measures should be taken to ensure that the corresponding solutions can be found in the first time when the transmission line fails. When the transmission line is in a complex environment, in order to effectively avoid the occurrence of faults, the close cooperation of line equipment is needed to improve the operation level of the transmission line.
The core part of power system is transmission line, but it is very likely to be infringed during operation. Therefore, the core method to ensure the normal operation of power grid is to improve the safety of transmission line operation.

3. The main causes of transmission line infringement
Due to the long-term outdoor operation of transmission lines, it is inevitable to suffer from environmental impacts, and the main reasons for the damage to transmission lines are as follows:

About the impact of lightning strikes: At present, more and more transmission lines are affected by lightning strikes, resulting in more and more phenomena that the lines cannot continue to operate. The probability of being struck by lightning will vary depending on the height of the transmission line tower. When the tower is high, the shielding effect of the ground is not very good. Therefore, it is more likely to be hit. In addition, transmission lines will also be affected by thunderstorms. When the angle between the two sides of the transmission line changes, the quality of power transmitted by the transmission line will be greatly reduced. For example, the transmission lines located in mountainous areas are usually at the top of the mountain, and the angles on both sides of the corresponding lines are relatively large, which makes the transmission lines more likely to be struck by lightning. When a line is struck by lightning, it will discharge, which poses a serious threat to the safety of transmission lines and the whole power grid.

Influence of weather: Transmission lines exposed to the atmosphere for a long time will inevitably suffer from low temperature rain and snow. In this weather, the air humidity is very high, which causes a large amount of water vapor to condense on the outer surface of the wire, resulting in freezing phenomenon, which reduces the quality of power transmission in the power system. This freezing phenomenon makes the tension on both sides of the transmission line unbalanced, which makes it easy for the wires to break and the poles to fall over. Due to a large amount of icing on the wires, the wires in a contracted state will break when they are exposed to strong winds, which leads to the failure of the power system to enter the normal working state.

About the influence caused by external force: due to the influence of external force, the power cannot operate normally during transmission. The reason for this phenomenon is that the staff did not do a good job in the maintenance of power equipment, which caused the whole line to be affected and the system could not operate normally. For example, due to the low personal quality of the staff, the protection of the line is not done in time, which leads to the abnormal operation of the system. However, when the workers control the transmission lines, they do not follow the rules, which damages the transmission lines and has a great impact on the related transmission equipment.

4. Preventive measures for operation safety of transmission lines

4.1. Strictly control the quality of products
The stability and safety of transmission lines can not be separated from the guarantee of line product quality, while higher product quality is the prerequisite for normal operation of lines, and the service life of equipment is closely related to product quality, so good product quality can effectively extend its service life. Therefore, it is very important for power grid enterprises to purchase the parts and related equipment of transmission lines, and they should be purchased from the partners designated by the state or the manufacturers whose products have reached the quality standards. At the same time, it is necessary to ask the merchant for the corresponding qualification certificate of the equipment and some technical instructions to check whether the transmission line products have quality problems. Before opening new equipment, staff must do a good job of equipment test. If problems are found, they must be dealt with at the first time, so as to effectively avoid some faults of transmission lines during operation.

4.2. Improve the prevention and control methods of transmission line
Because transmission lines are often damaged by freezing and lightning, it is the development trend of power grid enterprises to effectively improve the corresponding prevention measures. For example, the
lightning rod is the best lightning protection equipment. When installing the transmission line, due to the different environment around the area, some lightning rods can be installed appropriately. At the same time, it can reduce the grounding resistance of the tower, so as to improve the insulation of the transmission line. In addition, power grid enterprises should be set up in areas far away from reservoirs, easy icing and lakes to avoid freezing disaster by using current melting icing technology, so as to improve the safety of transmission lines.

4.3. Improve bird control methods
Transmission lines will also be affected by birds, so it is urgent to strengthen the prevention and control measures of birds. First, install some bird repellent devices to ensure that there will not be a large number of birds on the tower. Second, in the transmission line insulation can also be installed some other equipment, play a protective role. For example, bird repeller based on ultrasonic principle, thorn to prevent birds from falling, installation of some baffles, etc. The purpose of these methods is to prevent birds from staying on the transmission line, so as to reduce the failure rate. At the same time, we also need to consider the seasonal factors, properly improve the prevention ability, remove a certain amount of bird nests, reduce the number of birds around, so as to ensure the safety of the transmission line.

4.4. Strengthen the monitoring of transmission lines
With the great increase of people's demand for electricity, intelligent power system is the future development trend of power enterprises. The system can automatically detect the equipment. In the process of equipment detection, staff need to improve their computer application ability and enhance their perception ability, so as to realize intelligent detection of related transmission equipment. In addition, the application of some new equipment can also achieve the purpose of real-time monitoring of transmission equipment, such as airborne lidar and imager. When the transmission line fails, it can be processed at the first time, which improves the safety and stability of the line.

4.5. Strengthen the maintenance and regular maintenance of transmission lines
Power grid enterprises need to do a good job in the maintenance and regular overhaul of transmission lines, and increase efforts to improve the maintenance ability. Workers need to do a good job of division of labor before maintenance, which is required to be reasonable, so as to ensure that there are no loopholes in the maintenance process. According to the relevant operation requirements, each link should be strictly overhauled, so as to avoid the occurrence of maintenance errors. In addition, power grid enterprises need to build a team, whose duty is to manage maintenance effectively, record data well and analyze relevant data. Through group discussion, a reasonable maintenance plan can be worked out, and the work contents and corresponding working hours that need maintenance can be arranged, so as to achieve the purpose of preventing transmission line failures.

5. Conclusions
To sum up, many aspects will have a certain impact on the operation of transmission lines, reduce the stability and safety of transmission lines, lead to power system failures, and thus lead to some accidents, making people unable to live normally. Therefore, increasing the prevention and control of transmission lines is the inevitable trend of the development of power enterprises. Power enterprises need to do a good job in line maintenance and repair within a certain period of time, reduce the failure rate of transmission equipment, and make the transmission line more stable and safe.

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