

# Safety Problems and Preventive Measures in the Operation of Power Distribution Network

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**Abstract:** With the increasing application of power equipment and the increasing demand for market power, on the one hand, it accelerates the development of power enterprises; on the one hand, it also makes power distribution face great pressure. In the case of large amount of power consumption, the safety problems of some equipment not only affect the safety of distribution network, but also bring security threats to equipment users. In order to accelerate its own development, power distribution enterprises must do well in the safety management and maintenance of distribution network, so as to ensure the safety and reliability of power distribution. This paper introduces the importance of safe operation of distribution network, analyzes the problems existing in the safe operation of power distribution network, and actively explores the countermeasures of power distribution network safety management.

**Keywords:** Power; Distribution Network; Safety; Countermeasures

## 1. Importance of safe operation of distribution network

The power production and distribution flow chart is shown in Figure 1 below.

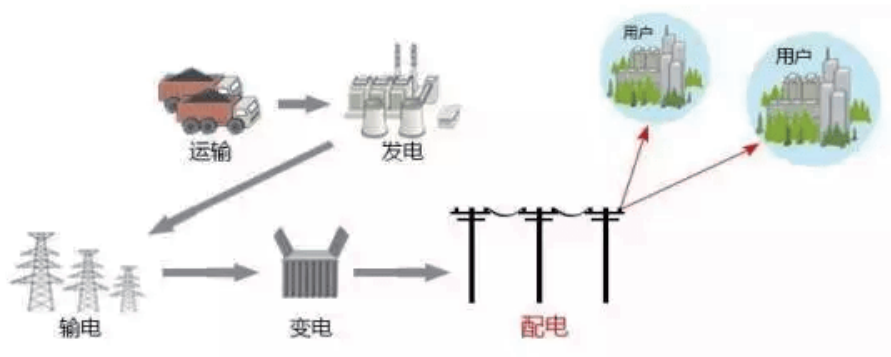


Figure 1. Power production and distribution flow chart

Generation, transmission, transformation and distribution, direct connection of distribution to users is a key part. The safe operation of power distribution network is very important. Strengthening the safety prevention and control of distribution network can effectively promote the smooth completion of relevant projects and ensure the quality of distribution projects<sup>[1]</sup>. In fact, the safety prevention of distribution network is a complex work. The corresponding operation is affected by many factors, which requires technical guarantee and reliable construction process. Therefore, the safety prevention and control of distribution network is needed. In the operation of distribution network, the power equipment and technology involved are relatively diverse. Strengthening safety prevention and control and management

can also reduce the failure and damage rate of equipment, improve the use effect of equipment, and extend the service life of equipment, etc., which also plays an active role in promoting the safe operation of the power grid and improving the economic benefits of distribution network operation.

## **2. Safety problems in power distribution network operation**

### **2.1 Safety problems caused by unreasonable design of distribution network**

Compared with other types of engineering construction, the construction period of distribution network is generally longer. At the beginning of the design of power distribution network in many areas, the future development and demand of power distribution were not taken into account. Therefore, in the early design, the compatibility and expansibility of the distribution network were not considered. As a result, with the increasing number of power equipment in the later stage, the pressure on the distribution network was also increasing, and eventually the distribution network could not bear the huge power load and affect its safe operation. In the design of distribution network, due to the lack of overall thinking, the distribution network faces a lot of difficulties in the later maintenance and overhaul, which will also lead to the increase of the probability of safety problems. At present, in the design of domestic distribution network, the radioactive network structure is often used. This kind of distribution network can meet the needs of power supply, but its reliability is not high in the specific operation. Because of the lack of interoperability between radioactive network lines, if a line fails or is abnormal, it may lead to the normal operation of the whole distribution network, raising security issues<sup>[2]</sup>. In the final analysis, there is a lack of rationality and overall planning in the design of distribution network.

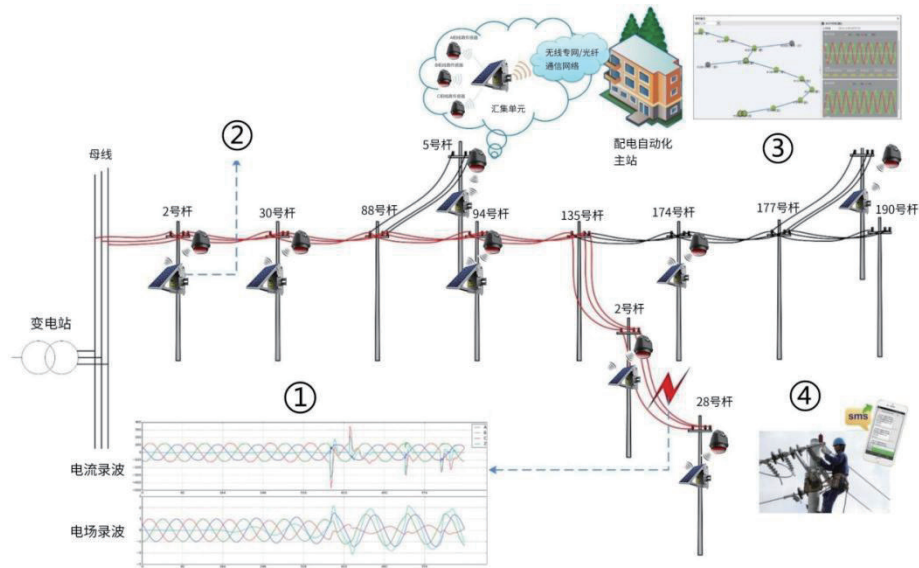
### **2.2 Imperfect management and maintenance mechanism of distribution network**

There are many security problems of distribution network that do not happen suddenly. If some small faults and anomalies are not handled in time, they will lead to bigger problems, and even cause the security failure of the whole distribution network<sup>[3]</sup>. In addition, in the operation of the distribution network, some parts are in the constant aging process with the passage of time. If they are not replaced and maintained in time, it will lead to the safety failure of the distribution network and cause safety problems. As far as the current management of power distribution network is concerned, the corresponding maintenance work is not actively carried out. Most of the time, the reasons are found after the problems of power supply and equipment, which affect the safe and orderly operation of the power grid. At present, the safety management and maintenance system of relevant power distribution network enterprises has been established. However, the relevant maintenance system is updated slowly, and some management and maintenance mechanisms have fallen behind, which leads to the lack of specific standardization in the current distribution network safety management and maintenance, and the problem of safety failure cannot be effectively reduced.

## **3. Countermeasures for problems in operation of power distribution network**

### **3.1 Optimizing distribution network design and improve system compatibility**

At present, the scale of the distribution network is expanding. In the design of the distribution network, we should consider the development trend of the current power market and the future distribution demand. In the design, we should appropriately expand the system capacity, optimize the distribution structure, improve the system compatibility, and carry out the overall design of the distribution network. At the same time, we should also consider the later operation, service and maintenance. Considering the maintenance and other work, a reasonable distribution network structure should be designed to promote the continuous improvement of system compatibility. As shown in Figure 2 below, it is the diagram of distribution network detection system<sup>[3]</sup>.



**Figure 2 Distribution network detection system diagram**

By setting up the state detection system in the distribution network, the operation state of the distribution network can be detected in time, and be grasped dynamically, so as to take precautions.

### 3.2 Strengthening the maintenance work of distribution network and find problems in time

The security of distribution network is of great importance and needs to be paid more attention<sup>[4]</sup>. In this regard, the enterprise should actively improve the power distribution network maintenance system, and strengthen the management and maintenance of the distribution network. In view of the problems of long-term transformation, aging of lines, poles and porcelain bottles, and the power failure of the line in case of severe weather, the company can conduct a comprehensive arrangement of the line, and include all the departments required for eliminating the shortage of the line in the operation plan, and replace the porcelain bottles and cables in three groups, adding new pole to adjust sag work and preparing for the war in a "combat" state<sup>[5]</sup>. First, a "centralized maintenance front-line operation room" is set up to formulate a centralized maintenance operation plan of "fighting against the distribution network". Six operation teams were set up, including on-site safety control, operation plan control, maintenance material management, engineering quantity supervision, user equipment control, field reporters and logistics support, in order to formulate operation plans and design routes in the way of reverse schedule. The "operational command order" is used to issue the plan and task in a unified way, and the head of each department and the director of the power supply station are taken as the first person responsible for the maintenance work. We adhere to the principle of "one game for the whole situation, one shot for the whole battalion", resolutely implement the combat plan, effectively reduce the failure rate of the distribution network, and improve the safe operation efficiency of the distribution network.

## 4. Conclusion

The safe operation of power distribution network is the key to ensure the safety of power consumption and equipment. In terms of the current safety problems of distribution network, the relevant grid design is unreasonable, which leads to the safety problems in the operation of distribution network. In addition, the imperfect safety management and maintenance system of the relevant distribution network also leads to the increase of the probability of safety problems. Therefore, measures should be taken as soon as possible, optimizing the distribution network water, and strengthening the maintenance work of the distribution network, so as to effectively improve the compatibility and safety of the distribution network, ensure the safety of transmission and distribution, and reduce the power grid failure to improve the market competitiveness of the power distribution network enterprises.

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