Analysis on Operation and Maintenance Management Mode of 35kV and 110kV Transmission Lines

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Abstract. At present, in the process of social development, the demand for electric power and energy continues to increase. In order to ensure the stability of public power grid operation, electric power enterprises need to actively carry out the operation and maintenance management of 35kV and 110kV lines. This paper analyzes the operation and maintenance management problems of 35kV and 110kV transmission lines, introduces the optimization points of operation and maintenance management mode of transmission lines, and puts forward some guarantee strategies.

Keywords: Transmission line, operation and maintenance management, mode analysis.

1. Introduction
For power grid security, transmission line operation and maintenance is an important link. China's transmission lines are widely distributed. At the same time, with different conditions and complex environment in different regions, transmission line operation has higher requirements in terms of tools, staff and professional skills. Traditional operation and maintenance management mode can't guarantee that the requirements of large-scale overhaul and quick repair can be fully met, so it is necessary to build a management scheme with strong professionalism and outstanding feasibility to fully improve the quality and safety of transmission lines [1].

2. Analysis on operation and maintenance management of 35kV and 110kV Transmission Lines

2.1. Large management radius
At present, China's transmission lines adopt centralized management mode, which makes the original management team at the grass-roots level cancelled, mainly managed by the company in a unified way. At the same time, the post establishment of "three sets and five big ones" has not increased with the expansion of the line scale. This mode brings great pressure to the transmission management department. Therefore, the line condition of grass-roots enterprises is poor, and some problems need to be further dealt with. However, the management can't devote all its energy to this work, mainly dealing with critical and serious problems, so the problem solving efficiency can't meet the requirements of transmission line operation. At the same time, the working standards of managers are relatively uniform, and the actual needs and characteristics of various regions are not effectively analyzed, which makes it difficult to effectively implement some measures.
2.2. The personnel structure is insufficient

Due to the staffing problem, the working group for transmission and inspection established by the personnel of grass-roots enterprises cannot enter the company's staffing from the personnel point of view, and usually carries out related work with the help of secondment. Welfare, performance appraisal and personnel management are mainly the responsibility of grass-roots enterprises, while the municipal company transportation inspection city is responsible for business management. An employee often needs to know two different management systems, so there are certain management conflicts. At the same time, because the seconded personnel did not fully bring good benefits to their enterprises, the county grass-roots enterprises adopted a marginalized attitude towards these employees, so the performance was low, resulting in the employees could not be fully promoted. These problems have a great impact on the enthusiasm of the staff of the transmission operation inspection working group, so the operation and maintenance work can not fully guarantee the work quality [2].

3. Optimization of transmission line operation and maintenance management mode

3.1. Solution of operation and maintenance mode

Before optimizing the operation and maintenance mode, the deficiencies and problems in the original operation and maintenance mode should be fully analyzed, as shown in Figure 1.

![Figure 1. Problems to be solved in the operation and maintenance model](image)

To solve this problem, the following solutions can be adopted.

1) Manage staff energy. First, according to the importance and distribution of the lines, the county power supply enterprises are responsible for the county 30KV and 110kV lines, and the city power supply enterprises are responsible for the urban 35kV and 110kV lines. Second, the transmission line operation and maintenance business ontology and channel operation and maintenance division, and channel business technology content is low, and need to invest a lot of energy, choose localized management means. Urban 35kV and 110kV channels are managed by service centers in different regions, and relevant management teams are established in different locations. Ontology operation and maintenance business does not need to invest a lot of energy, but it is strict in professional technology, so the municipal enterprise operation and maintenance room carries out the maintenance and operation and maintenance work.

2) Personnel management. At the same time, the county company reconstructs the county enterprise operation and inspection city on this basis, undertakes the corresponding 35kV and 110kV line operation and maintenance work, and effectively solves the problems of promotion path, welfare, performance appraisal and personnel management.

3) Internal resultant force. According to the detailed division of labor among the enterprises and departments involved in the transmission line, the responsibility interface is fully defined, the related
responsibilities are differentiated to different levels, the examination opinions are scientifically formulated, and the internal synergy of enterprises is fully improved.

(4) Management methods. Based on the new model architecture, the intelligent transportation and inspection system based on GPS technology and 5g network is developed, and then the hidden danger reporting and inspection scheme implementation are managed in real time. Continuous construction of visual lines, design and development of high reliability, low cost and lightweight intermittent monitoring system, and widely used in the line. At the same time, with the help of algorithm machine to identify construction hidden danger, effectively reduce the manpower problem, fully strengthen the inspection efficiency and frequency [3].

3.2. Operation and maintenance mode design

(1) The bottom system design. First, readjust and clarify the work interface. ① Professional management mainly takes county enterprises and transmission and transportation room as the interface to manage 35-110kv lines in direct supply area. First, the enterprise is mainly responsible for the corresponding 35-110kv management, and the transportation inspection room improves the technical support and professional guidance for the county enterprise. ② The channel operation and maintenance mainly takes the territorial unit and the operation and inspection room as the interface. The county is dominated by the territorial subject mode, and the county enterprise is the main body of operation and maintenance responsibility. The operation and inspection room performs the inspection, supervision and guidance work.

Second, build a full-time operation and maintenance team. County enterprises to build full-time protection team, can build rural power working group or workers working group, full-time to carry out line protection work. At the same time, it can establish cooperative relations with external line protection enterprises, outsource business, and carry out management assessment according to contract requirements. There are few workers in direct supply operation and maintenance, so it is possible to carry out the general business of line channel protection with the help of business outsourcing, strengthen the management staff allocation, actively apply management methods, and control the protection enterprises according to market rules.

Third, municipal enterprises can set up a "working group for line protection and control", and the vice president of production will assume the position of director. At the same time, local units, Ministry of Construction, Development Department, Marketing Department, Finance Department, Human Resources Department, Transportation Inspection Department and other departments participated. These departments are mainly responsible for improving operation and maintenance management, and studying the difficult and important problems in line protection.

(2) Top-level system design. With the help of uniting different units and fully sorting out the responsibilities of units, power supply enterprises simplify the processing flow, continuously improve the quality of operation and maintenance management, effectively strengthen work efficiency, and transform the traditional holistic management mode to the model management mode, thus transforming the traditional decentralized management from superior to subordinate.

Transmission line operation and maintenance mode mainly covers line operation and maintenance, operation and maintenance supervision, operation and maintenance cost and ontology management. Fig. 2 mainly shows the actual responsibilities of different operation and maintenance departments, optimizing the processes of capital, risk supervision and control, sorting out the responsibilities of different departments, and fully improving the operation and maintenance management effect.
Figure 2. Operation and maintenance mode
This module mainly covers line engineering projects and emergency repairs, and divides responsibilities in the construction, application and construction of line projects, as shown in Figure 3.

Figure 3. Maintenance module
For subsidiary modules, it covers publicity and training, as shown in Figure 4.

Figure 4. Accessory module
Operation and maintenance units generally refer to county power supply enterprises, operation and inspection offices and customer sub-centers, which mainly undertake the main work of line operation and maintenance. Among them, the operation and inspection office belongs to the main body of
operation and maintenance management, and is responsible for the communication and supervision of the marketing department, development department, county companies and outsourced companies. County power supply enterprises are mainly responsible for the operation and maintenance of 35kV and 110kV line channels in the county.

4. Safeguard measures of transmission line maintenance management

4.1. **Optimization of comprehensive inspection system for transmission line protection**
First, different units continuously improve the effect of internal supervision through scientific methods. Each unit should actively strengthen the internal supervision according to its own safety supervision and operation inspection management system, and seriously carry out the territorial protection business of the line. It is necessary to actively strengthen the performance of protective personnel by positioning check-in and listing. At the same time, the internal supervision and control shall be submitted to provide a good basis for the assessment work.

Second, the transportation and inspection office conducts regular inspection work. The operation and maintenance working group of the operation and inspection room is mainly responsible for carrying out supervision and special patrol work, and should regularly carry out patrol work of the line body. When carrying out patrol work, supervise the prevention and control of newly added hidden danger points and key stocks of local units, and inform the protection office at the same time.

Third, improve the line protection and listing supervision function of safety supervision working groups at all levels. The supervision working group needs to conscientiously perform its supervision duties, supervise and inquire at any time, and submit the listing situation to the protection office.

Fourth, the protection office should actively organize relevant units to carry out supervision and mutual investigation. Relevant units need to organize local units to carry out supervision and mutual investigation every year, and actively carry out work exchange activities, so as to find problems in time and optimize work. For the inspection conclusions, positive incentives are mainly used to guide each unit to establish a long-term adherence concept and inject practical power [4].

4.2. **Optimize different protection and control systems of transmission lines**
First, the general manager office system. The general manager's regular office meeting is used to discuss and approve important rewards and punishments and major issues in the operation and maintenance management of transmission lines, and to study and decide on the treatment scheme of hidden dangers such as forest clearing and reconstruction and the implementation of funds.

Second, monthly assessment meeting. Relevant personnel carry out assessment work such as cleaning up hidden dangers and patrolling units for protection units every month, interview the person in charge of the last unit evaluated, and seriously put forward assessment suggestions and opinions, which are also included in the monthly performance test.

Third, weekly meetings. The staff are required to carry out the "Operation and Maintenance Management Briefing" every week, report the work situation, summarize the experience and practices, fully display the special highlights, report the relevant problems, and clarify the rectification progress and requirements. Through the weekly meeting to read out the briefing, and distributed to each unit, the advantages and disadvantages will be fully displayed, and then promote each other.

Fourth, the morning adjustment meeting. The unit responsible for tripping elaborated through the morning dispatching meeting, and the territorial unit elaborated on the problems of line inspection absence, hidden danger treatment overdue and omission.

5. Conclusions
In a word, 35kV and 110kV lines are the key contents in smart grid, so the requirements for transmission quality and safety are stricter in operation. Therefore, in the process of constructing the operation and maintenance management mode, it is necessary to actively analyze the shortcomings of the original management mode. At the same time, the design is optimized from the bottom and top perspectives, and
optimized by optimizing the comprehensive inspection system of transmission line protection and different protection and control systems of transmission lines.

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