



Analysis and Study of Influence Factors and Control Strategies For Power Grid Operation Costs

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ABSTRACT

At present, power grid construction is playing a more and more important role in development of China power sector because of maldistribution of electric energy. This passage is based on three steps in the electrified wire netting construction process: power transformation, transmission, distribution. By summing up the feature of them, some conclusions about influence factors of power grid operating costs are required. After that, this paper analyzes negative influence of high costs. At last, keeping a reasonable control on single cost is put forward to make controlling total costs strongly possible.

Keywords: Power grid construction; Engineering project; Operating costs; High costs; Influence factors; Control

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1. INTRODUCTION

In recent years, power grid construction has occupied an increasingly important position in China's power construction projects. With the expansion of scale, the power grid construction has gradually shown the characteristics of long transmission distance, large variable capacity and high operating voltage level. For China, which is still in the developing stage, operating such a large grid system is not a small expense. Therefore, under the premise of not damaging the interests of power users, it is particularly important today if we can find a scientific method to reduce the investment in power grid operation reasonably. This paper analyzes the basic com-

position and characteristics of the power grid and explains the adverse effects of high-cost power grid construction. Then analyze each part to summarize the major factors affecting the operating cost of the power grid, and according to various factors, discuss the corresponding solution strategy, and finally achieve scientific reduction. [1-2]

2. PROPERTIES

The power grid is an extremely important part of the power system. It is composed of substations of various voltage levels and transmission and distribution lines. The basic relationship is as shown in the figure1:

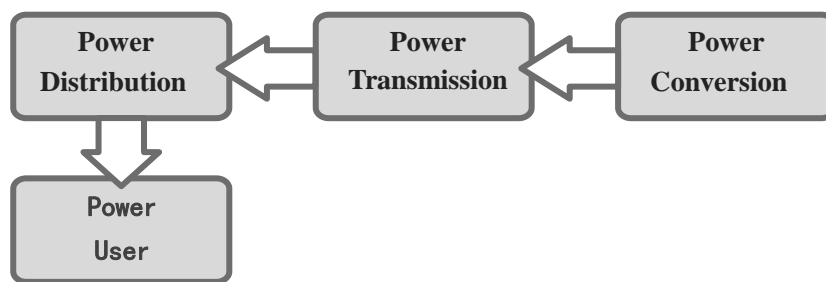


Fig. 1 The basic relationship between the components of the power grid

The power grid is responsible for the important task of changing voltage, delivering and distributing electrical energy. It consists of three parts, including substation, transmission and distribution unit. Among them, the main equipment used in the substation unit is a power transformer. Including step-up transformer, step-down transformer. For the main unit-the transmission unit, the focus is on the erection of the transmission line. The significance of this link is that the development and utilization of electric energy exceeds the limitation of space and region, and the allocation of electric en-

ergy resources in China is not solved to a great extent. The problem of both. Finally, it is the power distribution unit, which shoulders the important role of distributing the power of the power plant to millions of users, and is also the infrastructure construction of the city.[3]

3. ANALYSIS OF FACTORS AFFECTING GRID OPERATION COST

The factors affecting the operating costs of the grid can be roughly divided into three aspects, including people, materials and machinery, and their respective proportions are as shown in figure 2:

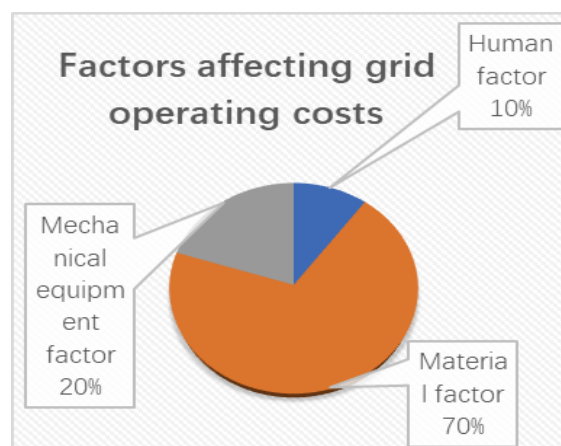


Fig. 2 The proportion of factors affecting the operating costs of the grid in the overall proportion

3.1 Human factor

In the process of power grid construction, labor costs are an important part of operating costs, accounting for about 10% of the total. Labor costs include basic wages for all workers involved in the construction of the entire project, performance appraisal bonuses, wage subsidies, labor protection fees for production workers, and so on. In the process of building a power grid project, due to the long period of time, the wages of workers calculated on a daily basis are also a small expenditure. More importantly, as the complexity of power grid construction projects continues to rise, the types of talents required in the construction process are more and more detailed. In addition to the general production workers, technicians, managers, and supervisors tend to be highly qualified. Accordingly, the expenditure on labor costs must increase substantially. Therefore, the human factor mainly affects the cost input from the two aspects of the number of people employed and the high demand for personnel. The technology of the project itself determines the requirements of the employer, so the control space in this area is not large. We mainly control the number of employees.^[4-6]

3.2 Mechanical equipment factor

In the process of construction, a large number of equipment is put into use, making machinery costs an important expense in grid operation. The mechanical fee includes the mechanical use fee during the construction process, as well as the transportation, disassembly, installation, and entry and exit costs of the machine, and the cost overrun is common in the implementation of the project. The reason is that in order to achieve the purpose of cost saving, when selecting a mechanical device with a relatively low price and a relatively simple performance, the device often fails in a high-intensity working environment. Therefore, it is necessary to pay a lot of equipment maintenance fees. In addition, due to the failure of the equipment to be put into normal use, the construction period will be lengthened, resulting in additional expenses for personnel lost time. In severe cases, the construction period will be delayed and additional compensation will be generated. In contrast, the purchase of high-priced, high-performance machinery to avoid accidents during construction has reduced the risk, but the large amount of money invested will still impose a significant burden on operating costs. At the same time, the low uti-

lization rate of equipment is also a common phenomenon in the construction of power grid engineering. The situation of idle mechanical equipment and increased mechanical demand often occurs. In addition, if the daily maintenance of the equipment is neglected, the cost of equipment maintenance will also increase.^[7-8]

3.3 Material factor

The material cost is the most important component of the construction project cost input, accounting for about 60%-70% of the total cost. The so-called material fee includes the purchase fee of the material, the circulation fee, and the storage and storage fee.

The purchase fee includes the cost of purchasing the raw materials, auxiliary materials, parts, and semi-finished products required for the implementation of the project. The purchase of semi-finished products can reduce the cost of pre-production processing.

The circulation fee refers to the logistics fee necessary for the transportation of materials, which is determined by the distance between the place where the material is purchased and the construction site. At the same time, in the process of transportation, material loss will inevitably occur, so the utilization rate and loss rate of the material also affect the expenditure of this item. The resettlement storage fee is the expenses that must be paid for the storage of materials, including the salary of the inventory management personnel, the land occupation fee, and the material finishing fee. Moreover, due to the large scale of the power grid construction project and the vast geographical area spanned, there is still a large mobility of the storage area, which is also a factor for increasing expenditure. Through the analysis of the material cost structure, the control of this cost can be started from the price of the material and the amount of the material.

4. ADVERSE EFFECTS OF HIGH COST CONSTRUCTION IN GRID OPERATIONS

4.1 Difficulties in raising funds

If the cost of grid operation is too high, it will cause the grid project to face the problem of raising high funds as reserves in the initial stage of construction. Because the amount of funds is too large, the grid operation will always be in the environment of debt management, which directly affects the profitability of power grid construction. The final result is that the difficulty of raising is greatly increased, including the large amou-

nt of funds faced in the process of raising, the short time in place, and the high security of funds.

4.2 Capital control pressure

Based on the reality of power grid construction projects, excessive costs will put a lot of pressure on capital management and control. The main performance is that the risk of capital control is large and difficult. Since the excessive amount itself will make the fund management and control risky, in addition to making the funds play their overall benefits, it is necessary to make the capital structure more scientific and the use of funds more optimized.

4.3 Project profitability is low

The large amount of operating costs invested in the construction project will make the grid into a state of debt management for a long time after it is put into production, so the profit target can only be extended. Because the initial profit must be used to repay the funds used for construction, this has a very large impact on the recovery of the operating costs of the grid and the realization of the profit target, resulting in a decline in the overall interests of the power grid construction. [9]

5. CONTROL STRATEGY FOR GRID OPERATING COSTS

5.1 Control of the number of workers

In order to ensure the quality and efficiency of construction, scientifically control the number of workers. It is necessary to reduce the time-consuming of certain processes and shorten the engineering cycle in a targeted manner, thereby rationally controlling the number of laborers and reducing the labor costs. Based on this, the following strategies are proposed: Before the construction, it is expected that the total number of work and the number of work in each project will roughly calculate the total amount of contracted expenses, so that the final settlement will be compared; the total project will be divided into several stages, and each stage will be reasonably estimated based on actual experience. The number of jobs and the shortest hours of work are reduced by reducing the number of non-production workers. The person in charge at each stage before the start of construction is used as the basis for controlling the number of laborers. It is required to make full use of effective working hours and scientifically arrange personnel to avoid situations in which people are overstaffed. At the end of the project con-

struction, compare with the actual situation. If the number of employed workers and working hours exceed the expected amount, it is required to investigate the responsibility of the responsible person.

5.2 Material price control

Prices here include purchase price, transportation and miscellaneous fees, and material loss during transportation. So controlling prices can start with the following:

(1) Control the purchase price.

First, a reasonable procurement plan needs to be developed before purchasing materials. This program requires the total cost of scientifically budgeted materials for professionals with an overall ability to estimate the project. Second, the point to be clear is that the purchase price is not as low as possible. Because usually, the price is directly proportional to the quality. Too low a purchase price means that the quality of the material is not guaranteed, which in turn makes the subsequent repairs bring extra expenses and is not worth the candle. Therefore, when purchasing materials, the cost should be strictly controlled within the budget. Under the premise of ensuring quality, shop around and choose the lowest price supplier. In addition, according to the type of project to which the material belongs, the number of consumption, and the impact on the quality of the project, it can be divided into different levels, different procurement principles, bulk purchase, and lower purchase price.

(2) Control of transportation and miscellaneous fees.

According to the construction site, choose the best supplier nearby. A transportation agreement is signed with the supplier in advance, and is required to be delivered to the designated place in the specified package. If the place is changed privately, the additional cost will be borne by the supplier.

(3) Control loss.

This requires on-site inspection personnel to fully fulfill their work obligations, carefully check and accept when receiving materials, and strictly record the work results to avoid the loss of materials into the cost.

5.3 Material usage control

It mainly adopts the method of collecting materials by quota, and establishes a system of consumable materials for strict acceptance, registration, collection, supervision and recycling of materials. When the material enters the constr-

uction site, special inspection personnel are set up to carefully record the number of materials. And to develop a material supervision system, for each material used in the construction process, it is required to make a strict record, and regularly check and supervise the amount of construction materials. Timely return the materials that have not been used up, and do the registration in the warehouse to improve the recycling system of construction materials. Encourage the search for new technologies during the construction process. Under the premise of not affecting the quality of the project, use as low a price as possible and use less expensive materials. The amount of material used has a reasonable distribution result. Or find alternative materials, which has a more significant effect on the control of material costs. Finally, it should be noted that the construction of a project, using hundreds or even thousands of materials, it is impossible to achieve strict control of each material. So scientifically classifying materials is especially important. According to the amount of materials, the price, the role played in the construction of the project, the materials are roughly divided into important categories. When controlling the materials, the key materials are seized, so that it is easier to achieve results.

5.4 Equipment cost control

In order to make more efficient use of mechanical equipment and achieve maximum control over equipment costs, the following strategies are proposed:

- (1) According to the construction content of each project in the construction plan, select the matching mechanical equipment. Make the project and equipment reach a higher level of co-operation. The investigation of the fit is mainly done from the aspects of cost, performance and quantity of equipment.
- (2) In order for mechanical equipment to perform at its maximum efficiency, it is important to have a high degree of consistency between the operator and the equipment. Machines with different operational difficulty do not need professional level personnel, which can effectively avoid the delay of the construction period due to insufficient operator proficiency, so that the utilization rate of the equipment is better improved.
- (3) The cost of maintaining the equipment also accounts for a part of the cost. However, if the machine is shut down in order to save this cost, it will not be worth the loss, because the failure

of the equipment will inevitably lead to delays in the project. At this time, not only the maintenance equipment has to be partially spent, but also the losses caused by the delay of the construction period. Therefore, it is very necessary to carry out regular maintenance of the equipment during the construction process.^[10]

6. CONCLUSION

By analyzing the project characteristics of each link in the construction process of power grid engineering, this paper summarizes the three factors that affect the operating cost of the power grid, and proposes an effective solution strategy for each factor, so as to achieve the impact on the premise of not affecting the quality of the project. Reasonable and effective control of costs.

From the adverse effects brought about by high costs, scientific control strategies have very important practical significance for the country's economic construction.

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