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MAXIMIZING RETURNS: A HOLISTIC EVALUATION OF POWER GRID INVESTMENT DECISIONS USING MIXED BINOMIAL COEFFICIENT AND COEFFICIENT OF VARIATION

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Abstract
The investment evaluation of power grid construction projects is a necessary link for power grid companies to carry out power grid construction. In the traditional evaluation process, it is generally based on the original index scores or similar schemes for comparison and decision-making. There are problems of simple methods and insufficient theoretical support. Fully considering various factors in the investment process of power grid construction, a set of rating index system with three-level hierarchical structure is constructed with actual demand as the standard. The evaluation model is verified and analyzed by an example.

Keywords: power grid investment; decision evaluation; level-related evaluation model

1. Introduction

Power grid investment projects often require a huge amount of funds, and there are many types of projects that the power grid should invest in. The power grid must consider how to divide the limited funds into the investment of different power grid construction projects. With reasonable arrangements[1-3].How to establish a set of operational project selection scheme and how to evaluate the investment decision-making of power grid construction are important issues currently facing. Generally speaking, the evaluation of power grid construction projects mainly includes two aspects, one is technical evaluation, and the other is economic evaluation. The former mainly examines the necessity, urgency, technical feasibility and rationality of technical standards of project construction; the latter mainly examines the economic benefits and utilization rate of the project after it is put into operation. As far as investment optimization is concerned[4-6], since the selected projects are all from the power grid rolling planning database of the provincial power company, the technical feasibility of the project itself has been fully demonstrated. The technical assessment should mainly focus on the urgency of the project. Is there a possibility of delaying construction and whether the technical standards are inappropriate. At the same time, due to the particularity of power grid construction projects, it is difficult to measure the benefit of the output of a single project, so the economic assessment mainly focuses on the analysis and evaluation of cost and utilization rate. Power grid construction projects must implement limit design to achieve static control and dynamic management of investment[7].

For the quota design, the General Electric Power Planning Institute has issued a set of standards, see "Reference Indicators for the Design of Thermal Power, Substation and Power Transmission Projects"[8-10], and will be revised annually to reflect the latest cost level. By analyzing the cost composition of power grid construction projects, it can be seen that the equipment cost has the greatest impact on the cost, while other costs are the fastest rising cost in the cost. Therefore, to check whether the cost is reasonable, the main analysis of equipment costs and other both parts of the cost. Equipment cost analysis is mainly used to determine the equipment standard[11-14].The rationality of the standard is whether it conforms to the current design regulations and standards; other cost analysis mainly examines whether the value of each rate and whether the calculation base conforms to the relevant regulations. In particular, it is necessary to pay attention to whether the construction site preparation cost in different regions is reasonable. Project management objectives mainly involve four aspects, namely cost, duration, quality and safety. Fully demonstrate the necessity of the project construction. After deciding that the project should be launched, a necessary part of the preliminary work is to review the cost level of the project. Check the reasonableness of the cost. Special attention should be paid to analyzing the cost situation with a large fluctuation range, to see whether it is within a reasonable fluctuation range, and to determine whether the project should be postponed for construction[15-17].At the same time, as mentioned above, the investment reform plan requires enterprises to pay more attention to the analysis of investment benefits and the impact of investment projects on society, economy and environment. These should also be reflected in the indicator system. According to the analysis of the main influencing factors of power grid investment as mentioned above, the comprehensiveness and operability of the evaluation indicators are the principles. This paper analyzes and selects indicators that affect the decision-making of power grid project construction, and divides them into 8 categories. Three-level hierarchical structure. The ratio indicators have corresponding calculation formulas, and the subjective indicators have corresponding evaluation rules.

2. Project Investment Decision Evaluation Model

The distribution network is an intermediate link between users and power generation and transmission systems, and an important link to ensure the provision of high-quality, high-reliability electrical energy for users. With the rapid development of the economy and the continuous progress of the society, people's living standards are improving year by year[18-20],and the requirements of power users on the reliability of power supply and power quality of the distribution network are also gradually increasing. The construction of distribution network has been paid more and more attention, and its investment scale has also shown a trend of increasing year by year. Faced with the growing investment in distribution network, investment direction and investment benefits have become the focus of power grid companies. However, at present, my country's distribution network investment generally has problems such as unreasonable capital allocation and poor investment balance. At the same time, there is a lack of distribution network investment benefit evaluation and investment direction optimization tools, and distribution network investment optimization has been greatly improved. Therefore, it is necessary to carry out in-depth research on distribution network development and investment decision-making, establish a complete evaluation system for power grid investment and construction, and form a dynamic evaluation method for distribution network development and investment decision-making that rolls year by year, so as to improve my country's distribution network development and investment decision-making. At present, in the research field of investment decision-making method of distribution network, there are research on investment decision-making method of high-voltage distribution network 35kV and below voltage[21-23].

Research on investment decision-making in hierarchical distribution network, but there are few researches on dynamic evaluation methods for the development and investment decision-making of the entire urban distribution network, and at present there are no research results on investment decision analysis based on distribution network project categories. Among them, the literature proposes a mathematical model and algorithm for distribution network investment allocation decision. In the method, the upper limit and lower limit of distribution network investment are used to reasonably adjust the distribution network investment in various regions, but the specific investment of a distribution network in a certain region cannot be determined. direction. The literature proposes an evaluation system for construction investment decision-making of high-voltage distribution network, but it cannot be used for investment decision-making of the entire distribution network. The literature proposes an annual investment decision-making model for distribution networks with voltage levels of 35 kV and below, which is based on the scale of the power grid and electricity sales, and is guided by the evaluation score of the annual investment benefit of a single project. The research content does not involve distribution networks with voltage levels above 35 kV, and the results are not universal; and the results derived from the investment decision model are the investment benefit level of individual projects, which cannot dominate the overall investment direction of the distribution network.

The literature proposes an auxiliary decision-making method for infrastructure projects. The results cannot cover all types of construction projects in the distribution network, and the results are not universal. Considering the lack of research in related fields at this stage, a dynamic evaluation method for distribution network development and investment decision-making is proposed. First, construct an evaluation index system for investment and construction of urban distribution network; secondly, construct an evaluation system for investment and construction of urban distribution network. Thirdly, the implementation method of investment and construction evaluation of urban distribution network is proposed. Finally case analysis is carried out.

3. Concrete construction evaluation index system

The demand of power enterprises is to improve their own operating efficiency. The improvement of operating efficiency of power grid enterprises needs to be carried out on the basis of ensuring the safe operation of the power grid and meeting the power supply demand, which is mainly reflected in the improvement of the utilization of power grid equipment and the reduction of network losses. In addition, the reform of "releasing competition on the electricity sales side" has made power companies pay more attention to seizing the electricity sales market and increasing the power sales of enterprises. Therefore, it is necessary to select the unit investment to increase electricity sales as the key to the distribution network based on the benefits of power companies. To sum up, starting from the goals related to the benefits of electric power enterprises, the key indicators selected include comprehensive line loss rate, equipment utilization rate, and increased power sales per unit investment. Electricity users' requirements for electric energy are mainly to reduce power outages and make good use of electricity. First of all, less power failure is the requirement for power supply reliability. Power supply reliability reflects the ability of the grid to continuously supply power, which determines the power supply reliability.

Whether the user can use the electric energy normally and effectively. Secondly, the requirements for good electricity use are the requirements for power quality. Power quality problems will have an impact on the security of the power system, which in turn affects the user's power consumption experience. Therefore, from the perspective of power user benefits, the selected key indicators include power supply reliability rate indicators and comprehensive voltage qualification rate indicators. The power grid expected by the society needs to meet the requirements of energy conservation and environmental protection, which is reflected in the reduction of power loss, and the comprehensive line loss rate is an index to measure the power loss during power transmission. Therefore, the comprehensive line loss rate index can be selected. The key indicators can reflect the improvement results of the operation status of the distribution network, but cannot directly evaluate the operation status of the distribution network.

For specific characteristic indicators, select the indicators that can clearly reflect the operation status of the distribution network, and establish an evaluation index system for the investment and construction of the distribution network. From a macro perspective, the factors affecting key indicators can be divided into three aspects: network structure level, load supply capacity and equipment technology level. From these three aspects, the specific characteristic indicators affecting key indicators are mined. The benefits of investment and construction projects can be reflected by the degree of improvement of various specific characteristic indicators of investment and construction projects in this year. According to the meaning of the indicators, the specific characteristic indicators of the distribution network are divided into positive indicators, negative indicators and intermediate indicators.

The positive index means that the higher the value of the index, the better, and the ideal value is 1; the negative index is that the lower the value, the better, and the ideal value is 0; the intermediate index value when the index value is in a certain range or a certain value, it means the standard is the best, and the ideal value is an interval or numerical value. Among them, the calculation methods of the improvement effects of various indicators are as follows. Through the next year's target value of the key indicators of the distribution network, combined with the corresponding relationship between project categories and specific characteristic indicators, and the corresponding relationship between specific characteristic indicators and key indicators, the important coefficients of project categories are finally determined, that is, various projects in the next year.

The importance of investment and construction depends on the degree of importance of investment and construction. Each specific characteristic index not only affects one key index, but also summarizes the degree of influence of each index on the distribution network according to the specific situation. If the index affects many factors, it will be more important to the distribution network. According to the importance of each index, an important coefficient is assigned to each specific characteristic index.

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4. Conclusion

In order to achieve multiple goals such as ensuring power security, stable operation, driving industrial development, and implementing the "carbon peak, carbon neutral" action plan, this paper builds a smart grid investment decision-making evaluation calculation method model, and expounds the derivative value of investment from an economics perspective. Concept constructs a multi-scenario-oriented derivative value investment criterion, and sorts out the smart grid investment method based on the promotion approach and industrialization method, puts forward the smart grid investment derivative value evaluation index system and its screening criteria; mixed binomial coefficient method and The coefficient of variation method constructs a subjective and objective fusion evaluation method of multi-objective dynamic balance. It has certain advantages in processing large-scale index data and can dynamically adapt to different evaluation scenarios and needs. The actual case of the power grid in northern China proves the rationality of the proposed evaluation method and investment suggestions and planning opinions for the typical area of the region.

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