

International Congress of Information and Communication Technology (ICICT 2017)

Research on Multi-Level Comprehensive Evaluation Model of Power Grid Efficiency

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Abstract

Power grid economic efficiency evaluation has been an important subject of Power Grid Corp. Nowadays, during the 13th Five-Year Plan period, the adjustment of China's strategy and planning has brought new challenges to the development of China's Power Grid Corp. Therefore, it becomes more important to evaluate the economic efficiency of power grid. Firstly, this paper establishes the evaluation index system of the economic efficiency of power grid. Secondly, using analytic hierarchy process to carry out empowerment for index. Finally, evaluate the economic efficiency of power grid during 12th Five-Year in a province of China, and summarize the operation situation of power grid economic efficiency of this province in 2013-2015.

Keywords: economic efficiency, evaluation index system, AHP weighting method

1. Introduction

The year 2016 is the beginning year of China's 13th Five-Year, the adjustment of the national strategy and planning makes the development of the Power Grid Corp face a series of complex new situation. In the aspect of national economic environment, economic downward pressure makes the economic efficiency of power grid investment become more and more important. In the aspect of energy system reform, energy structure transformation and electric power system reform not only provide the direction for the company to carry out power grid investment, but also bring challenges to the company's investment mechanism. In the aspect of enterprise management, the

development direction of the national grid put forward higher requirements for the lean management of power grid's investment.

Therefore, carrying out evaluation of power grid economic efficiency has important significance in two aspects, including answering to the strategic deployment of the State Grid Corporation and enterprise development requirements and realizing the effective improvement of the power management system of the power grid of the State Grid Corporation. This article carries out analysis of the economic efficiency of power grid in 3 aspects, including constructing evaluation index system of power network economic efficiency, empowering the various indicators and carrying out economic efficiency evaluation of power grid.

2. Research on evaluation index system of economic efficiency of power grid

The construction of evaluation index system of power grid economic efficiency requires explicit evaluation of the object. The evaluation object of this paper is the input and output of the power grid, and the construction of index system should set it as the main goal to determine the relevant indicators and obtain the data. In addition, the important aspects of the evaluation should be clear. For the power grid, its input and output index should be clarified, and then carry out the correlation analysis between them, so as to summarize the input-output indicators.

When selecting indicators, we should take the power grid investment management system and the development of strategic objectives as the key link, to analyze the key input resources and output data and to use the key success factor decomposition method to construct the performance index system of distribution network management. And then establish the connection between them from the qualitative and quantitative perspective, so as to construct the input indicators and output indicators covering economic efficiency evaluation index system of power grid.

According to the selecting thoughts of above indicators, this paper sorts out the grid input index system, as is shown in table 1:

Table 1 Input indicators system of power grid

Number	Key input indicators of distribution network
1	Investment to solve the equipment overload
2	Investment to meet the new requirements of the load power
3	Investment to eliminate equipment security risk
4	Investment to strengthen the grid's structure
5	Investment to meet the substation matching
6	Investment to meet the power access
7	Other investment

The selecting of the output index of the electric network should contain 7 aspects, including power supply capacity of power grid, power supply quality, power grid efficiency, comprehensive benefits, power grid structure, equipment level and intelligence level. On this basis, we analyze the distribution network output index system, as is shown in table 2:

Table 2 Power grid output index system

First-class index	Second-class index
Power supply quality	Average user outage time
	Average power outage frequency
	Comprehensive voltage qualification rate
	Low voltage user number ratio
Transmission and power supply capacity	Variable capacitance load ratio
	Heavy overload circuit ratio
	Heavy load main transformer ratio
Grid structure	Main transformer "N-1" pass rate
	Line "N-1" pass rate
Equipment level	Line section standardization rate

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