Research on Evaluation Index System for Life-cycle Cost Management of Power Grid Construction Projects

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Abstract. The power grid construction is an important part of the national infrastructure construction, and the investment for power grid construction is very large. With the rapid development of the power industry, Grid companies pay more attention to apply scientific and rational cost management methods to reduce the cost of power grid construction projects. This paper studies the cost management of power grid construction projects in various periods and establishes the evaluation index system of life-cycle cost management based on life-cycle theory to improve the cost management ability and income from investment.

Introduction

With the rapid economic development, power demand continues to grow. In order to meet the needs of social electricity, the speed of power grid construction is accelerating and the scale of investment continues to increase due to the unbalance distribution of electricity resources¹. In 2016, the investment of State Grid Corporation is about 497.7 billion Yuan. Power grid project cost management is particularly important because of huge investment. Power grid construction projects will experience the long and complex process of decision-making, design, construction, completion and acceptance, operation and maintenance². The traditional power grid cost control is only focus on the construction process, not the entire life cycle. There are limitations for the traditional power grid cost control. Establishing perfect evaluation index system of evaluation index system for life-cycle cost management of power grid construction projects based on life-cycle cost management theory will help to clarify the key points of power engineering cost management, optimize management and save investment.

Method

The life-cycle cost management theory is proposed by the western developed countries in the seventies and eighties of the 20th century. The life-cycle cost of the construction project is the sum of the initial construction cost of the construction process and the daily use cost of operation and maintenance process³. It covers the cost of decision-making period, the construction preparation period, the construction period, the operation and maintenance period. Life-cycle cost management can not only be used to analyze alternative schemes and engineering investment decisions, but also to make optimized selection based on the calculate for entire life-cycle cost of the projects. Power grid construction projects includes five process, such as pre-decision process, construction preparation process, construction implementation process, completion acceptance process, operation and maintenance process. This paper analyzes the content and key points of the cost management in each process of whole life-cycle for the power grid construction project, selects the evaluation index of the cost management, establishes the evaluation index system of life-cycle cost management to reduce the construction cost and improve the investment utilization rate.
Analysis of Life Cycle Cost

There are different characteristics at different stages of power grid construction project, so power grid construction has a different cost management key point and evaluation indicators at different stages.

The decision-making stage is the decisive stage of the overall cost management for power grid construction project. It compares the investment plans and estimates the feasibility and necessity of the projects through technical and economic analysis. The things firstly needed to be taken into account are the necessity, feasibility and economic of the new grid construction project. The necessity of grid construction is determined by the power load demand, and the grid construction must match the power load. Power grid must be built in advance to meet the power load demand because of the long construction cycle.

The construction preparatory stage for grid construction project determines the survey and design corporation through bidding and bidding based on feasibility study report. The design stage has a decisive effect on the cost control of the power grid construction project. The cost control of design stage directly affects the progress, implementation and using effect. According to the relevant information, the design stage effects on the entire project cost by 40%-85%.

The implementation stage cost management for power grid construction project includes bidding in implementation phase and construction phase. The construction organization for power grid construction project must be selected by bidding according to Chinese laws. Cost management of bidding phase are main composed of bidding documents, base price edition, the selection of way to contract, type of contract price and quotation. Controlling the budgeting according to working drawing and project settlement are the main constituent part in construction phase. The mainly cost controlling work in construction process is changing management and claim management to ensure the progress of the project based on contract.

The mainly cost controlling work in completion acceptance stage for power grid construction is conducting the project quality acceptance and compiling statement of final account. After engineering settlement, the cost controlling work is compiling actual statement of final account and writing the use and disbursement of funds and summary documents for the construction results based on completion engineering settlement, other additional costs and other expenses.

The cost management of the operation and maintenance phase of the power grid construction project is selecting the reasonable operation and maintenance plan, realizing the comprehensive management goal and reducing the operation and maintenance cost with minimum whole life cycle cost. Under the premise of ensuring the quality and safety target, cost management is controlling the process cost, marketing cost and daily expenses.

Evaluation Index System Construction

Early Decision-making Stage Evaluation

In the early decision-making stage of power grid construction project, the cost control evaluation based on the basis of setting up, contrast planning report, power grid planning and urban planning, regional power load forecasting matching degrees and these are limited. At this stage, the indexes which have an impact on cost are feasibility study depth standard, the scientific nature of investment estimation method, grid construction investment risk, power grid construction necessity.

Evaluation of Construction Preparation Stage

The mainly works in evaluation of construction preparation stage are judging rationality of material management, reasonable of preliminary design depth, accuracy of the budget estimate, timeliness of the contract signed and standardization of the bidding work. Cost control at construction preparation stage must ensure the project cost lower than project estimation through improving the comprehensive level of design stage, optimizing design plan, reducing major design change and adjustment of plan.
Construction Implementation Phase Evaluation

The evaluation basis of the implementation stage of power grid construction is the project decision-making and construction preparation stage. The influence cost factors mainly include construction conditions, contract mode, detailed contract terms and procedure rationality.

Evaluation of Completion Acceptance Stage

The mainly works at evaluation of completion acceptance stage are conducting a comprehensive inspection for settlement data, finding the problems existing in the engineering settlement and final accounts and put forward the corresponding countermeasure to the problems to ensure the reasonable and accurate measurement engineering cost. The engineering financial analysis analyzes is the indexes of assets based on the financial data coming from the actual project.

Evaluation of Operation Maintenance Stage

The operation maintenance evaluation is mainly the daily operation cost after commissioning of the project, including equipment energy cost, daily inspection and construction expenses, environmental protection expenses, regular repairs, temporary maintenance, and overhaul costs.

This paper has established a set of power grid project life cycle cost management evaluation index system through the above analysis. The power grid project life cycle cost management evaluation index system has 5 primary targets and 18 secondary evaluation indexes as shown in the following table.

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<th>GOAL</th>
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<td>accuracy of power load forecasting</td>
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<td>CONSTRUCTION LIFE-CYCLE</td>
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<td>necessity of power grid construction</td>
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<td>COST MANAGEMENT</td>
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<td>investment risk and benefit analysis</td>
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Summary

This study analyzes the important influencing factors and the key points of cost control in 5 process for grid construction, decision-making, construction preparation, implementation, completion acceptance and operation and maintenance and establishes a set of relatively complete cost management system. The evaluation index system provides a reference basis for the cost management of power grid construction, which can help to improve the cost management level of power grid construction project and optimize the investment benefit of power grid construction project.
References


