Study on the Investment Calculation Method of Water and Soil Conservation Measures Based on Monte Carlo Simulation Method

Xiaoyan Yu[a], Min Yu[b], Xiaoyong Yang[c], Fuyan Liu[d*]
*Corresponding author's e-mail: fyanliu@163.com

[a]e-mail: yuxy1209@163.com, [b]e-mail: minyu20211209@163.com, [c]e-mail: ngxy20213@163.com, [d]e-mail: juzen123@126.com

Economic and Technological Research Institute, State Grid Zhejiang Power Co., Ltd., Hangzhou 310000, China

Abstract. The construction and operation of soil and soil conservation measures are the prerequisite for the production and use of power transmission and transformation projects. However, the current cost of water and soil conservation measures in power transmission and transformation projects lacks the corresponding investment standards, which cannot effectively guide the power grid enterprises to scientifically formulate the investment scale of the cost of soil and water conservation measures, which is not conducive to improving the environmental protection benefits and economic benefits of the project construction by enterprises. In view of this, this paper systematically analyzes the framework of soil conservation measures for the completed water transmission and transformation project in the ZJ province and transformation project, proposes the investment and calculation method of the project, and finally, selects the temporary engineering measures as the research project to verify the effectiveness of the model method. This method and model can provide a basis for power grid enterprises to conduct soil and soil conservation management and investment estimation, reduce the economic loss and environmental damage caused by the unimplementation of soil and water conservation measures, and bring obvious economic and environmental benefits.

Keywords: Monte Carlo simulation method, power transmission and transformation project, water and soil conservation measures cost, calculation method

1 Introduction

At present, as the public's awareness of ecological and environmental protection has increased, water and soil conservation work in power transmission and transformation projects has attracted more and more attention and extensive attention from all parties.

Literature [1] introduces some practical water and soil conservation measures to provide a scientific basis for ensuring the safe transmission of electricity, reducing soil erosion, and protecting the ecological environment. Literature [2] is based on the CSLE model, with GIS and R support, using multiorder natural breakpoint method and spatial stacking analysis to conduct soil erosion risk assessment in a certain area and analyze its spatial distribution characteristics and risk relations. Literature [3] combined with the project construction examples, according to the actual situation of the project and the project construction

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characteristics, divided the 500 kV power grid in the northwest of the mountain, analyzed the possible characteristics of soil loss caused in the construction process, and put forward the soil and water conservation prevention and control measures according to the different prevention and control zones. Literature [4] gives the soil erosion prevention and control countermeasures that focus on strengthening the supervision and management of soil and soil conservation during the construction period, and discusses how to design the soil and water conservation scheme of the integrated landscape grid-connected power generation project to effectively prevent and control the soil erosion problem of the integrated landscape construction project. Literature [5] takes the 500kV delivery project as the research object. From the design perspective, the design concept of water and soil conservation measures is discussed in detail, which provides reference for the subsequent development of soil and water conservation work of similar projects.

To sum up, soil and soil conservation measures are one of the research points of the construction and management of power transmission and transformation projects, but relevant scholars pay more attention to the engineering design and specific measures, while the research on the cost of soil and soil conservation measures is relatively weak. Therefore, the text combines the current situation and development needs of soil and soil conservation management of power transmission and transformation projects, and constructs the engineering measure cost calculation method based on Monte Carlo simulation, which can guide the power grid enterprises to further improve the lean level of engineering water and soil conservation measures cost investment.

2 This paper mainly focuses on the research ideas

On the basis of the water and soil conservation measures of ZJ, the main link analyzes the water and soil process affecting the construction process, consider historical engineering estimation and settlement, and refer to the empirical analysis to verify the effectiveness of the model method. The specific research ideas of this paper are shown as follows:

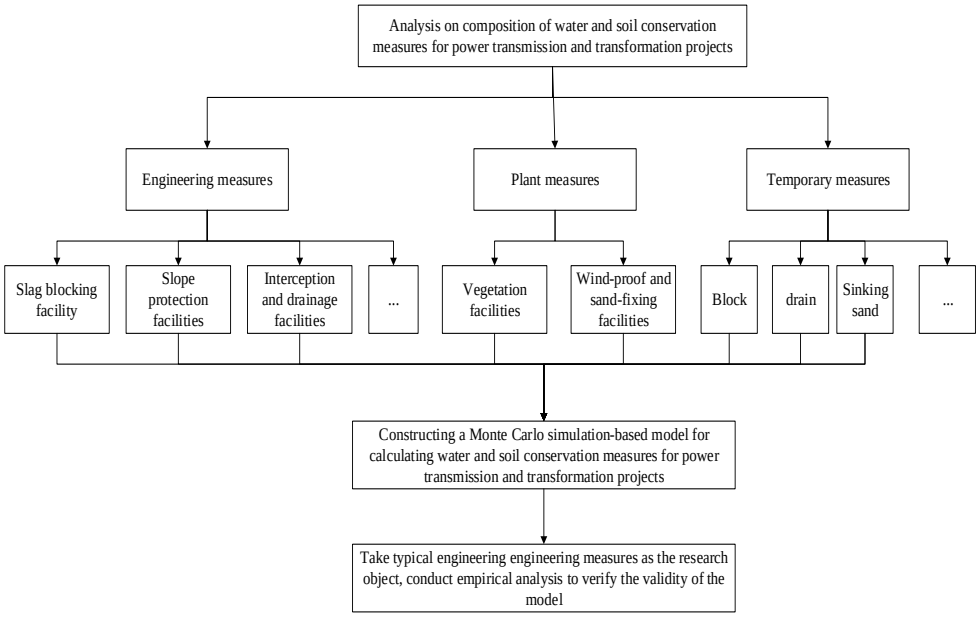

Figure 1. The research idea of this article.

3 Project framework of water protection facilities and measures

Water and soil conservation measures of power transmission and transformation projects can be divided into three categories: engineering measures, plant measures and temporary measures. Residue retaining facilities, slope protection facilities, interception and drainage facilities, precipitation and seepage storage facilities, surface soil protection measures and land remediation measures; vegetation facilities and sand fixation facilities are plant measures; slope protection facilities are engineering measures and plant measures; windproof and sand retaining facilities are engineering measures and plant measures; temporary protection measures include temporary blocking, drainage, sand subsidence, covering, etc. The details are as follows:

Table 1. Framework system of water and soil conservation facilities and measures.

Serial number	Project name	Type name	Subterm name	Remarks
1	Soil and water conservation facilities	Slope protection facilities	dry stone pitching	Included in the main works
2			Pulsed stone slope protection	
3			Concrete slope protection	
4			Pulout stone skeleton grass slope protection	
5			Vegetation and concrete ecological slope protection	
6			Three D vegetation network turf slope protection	
7			Ecological brick slope	

			protection	
8			Plasma stone retaining slag wall	
9		Cracking facilities	Concrete gear wall	Included in the main works
10			Shill stone castle	
11			Concrete Fort Cann	
12			Rainwater drainage line	
13			Reinforced concrete cut drainage ditch	
14			Pulout masonry drainage ditch	
15		Section drainage facilities	Brick mixed drainage ditch	Included in the main works
16			Cement concrete precast drain ditch	
17			absorption basin	
18			Shill stone retaining wall	
19			Concrete retaining wall	
20			Rainwater collection pool	
21		Precipitation storage facilities	Ecological brick	Included in the main works
22			Pervious brick	
23			evaporation tank	
24		Wind and sand fixing facilities	Coverage of gravel	Included in the main works
25			Grass square sand barrier	
26		Table soil protection measures	Surface soil stripping (manual)	Included in the origin of the level
27			Surface soil stripping (mechanical)	
28			Turf stripping maintenance	
29		Land consolidation measures	The surface soil is covered	Included in the construction site rental fee
30			Land improvement (livestock force construction)	
31			Land remediation (mechanical construction)	
32			strip tillage	
33			Fish scale pit land preparation	
34			Farmland recovery (livestock power)	
35			Farmland restoration (machinery)	
36		Plant facilities	Planting trees	Included in the main works
37			Planting shrubs	
38			Sast grass seeds	
39	water-and-soil conservation measures		Lay turf	
40			Weoven bag soil (stone) filling and demolition	
41			Removal of woven bags	
42		Temporary protection measures	Temporary drainage ditch	Included in the measures fee
43			Temporary sand sink	
44			mud-settling pit	
45			Color strip cloth pave the way	
46			The dense mesh covers	

47		Brown pad laying	
48		Steel plate paving	
49		The ribbon flag is protected	
50		Artificial transport	
51	Yu Tu transport	Mechanical transport	Included in the main works
52		Ropeway transport	

4 Study on the investment calculation method of water and soil conservation measures based on Monte Carlo simulation method

(1) Basic principles of the Monte Carlo simulation method

Monte Carlo simulation, also known as the computer random sampling simulation method, is a method based on probabilistic statistical theory. The basic principle of Monte Carlo simulation is: when the interpretation of the probability of an event, or a immediate variable mathematical expectation, or related to probability, mathematical expectations, through some test method to change time frequency, or the immediate variable several specific observations of the average, through it to get the solution of the problem. The Monte Carlo simulation principle is as follows:

Assuming a function:

$$y = f(x_1, x_2, ..., x_n) \qquad (1)$$

The Monte Carlo method uses a random number generator to take out each group of random variables $(x_1, x_2, ..., x_m)$ through sampling, and then determines the value $y_i = f(x_{1i}, x_{2i}, ..., x_{ni})$ of the function according to the relationship of $y = f(x_1, x_2, ..., x_n)$. Repeated independent sampling (simulation) many times $(i = 1,2,...)$, you can get a set of sampled data $(y_1, y_2, ..., y_n)$ of the function, when the number of simulations is enough, the probability distribution of the function y and its digital characteristics that are close to the actual situation can be given. And the more repetitions, the closer the simulation results are to the situation. The calculation accuracy of the Monte Carlo simulation method is proportional to 1/N (N is the number of sampling points), that is, a larger amount of calculation is required to achieve higher calculation accuracy, which can be easily realized by programming on a computer.

5 Empirical analysis

A power transmission and transformation station project in ZJ province was selected as an example, and the basic information of the main characteristics of the project and the land area of the project is given in the following Table 2:

Table 2. Basic characteristics of typical works.

Serial number	Project name	A substation project
1	Scale of construction	500kV and 220kV
2	Floor space	A total area of 6.70hm2, permanent area of 5.97hm2 and temporary area of 0.73hm2
3	Station road	The new road is 650m long, the road width is 6.0m, and the subgrade width is 9.5m, covering an area Area is 1.26hm
4	Water supply and drainage pipeline outside the station	Connect the water pipeline from the periphery
5	Total amount of earth and stone	400,200 m3, of which 214,500 m3,185,700 m3,05,100 m3 and the remaining 33,900 m3
6	Total project investment	Dynamic investment of 417.896,900 million yuan

Through the analysis of soil loss in the construction of the substation project, the layout of soil and soil conservation measures and soil conservation investment are shown in table 3.

Table 3. Layout of engineering water and soil conservation measures and water and soil conservation investment estimate table.

Serial numberr	Works and cost name		unit	quantity	Unit price (Yuan)	Joint price (ten thousand yuan)
1	divest the surface soil		ten thousand m^3	0.51	39200	2.00
2	drainage works	catchwater	m	700	580	40.60
3		Flood drainage ditch	m	418	720	30.10
4		drain-pipe	m	1841	480	88.37
5	Land consolidation project	site levelling	Hm 2	2.6	7800	2.03
6		earthing	ten thousand m3	0.88	71000	6.25

6 Conclusion

Based on the analysis of water and soil conservation measures for power transmission and transformation projects, this paper constructs a method for calculating the cost of engineering water and soil conservation measures based on the Monte Carlo simulation, and completes the calculation of standard costs for drainage projects and land improvement projects, and provides power transmission projects for power grid companies. Provide support for water and soil conservation budget management of substation projects.

In the future, we need to continue to improve the environmental and water conservation facilities, the content of measures and cost estimates, select a number of power transmission

and transformation projects in different regions to carry out environmental and water conservation facilities project engineering cases, and organize construction units, design institutes and other units to carry out project cost calculations to ensure The rationality and applicability of environmental protection facilities measures and special expenses.

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