Research on Environmental Cost Management of JN Electric Power Group based on Double Carbon Target

Yiqing Xu, Haiyan Zhao*

Business School, Lingnan Normal University, Zhanjiang, Guangdong, China *Corresponding Author.

Abstract: In September 2020, China clearly proposed to achieve the goal of "carbon peak" in 2030 and "carbon neutrality" in 2060 (referred to as the "double carbon" goal), which is China's responsibility as an international power to achieve a community of human destiny and environmental protection requirements, and the inevitable choice for China to achieve sustainable development. As one of the industries with high carbon emission, the power industry's environmental cost management is particularly important for the realization of the "double carbon" goal. Taking JN Electric Power Group as a case, this paper adopts case analysis, literature analysis and quantitative analysis to analyze the environmental cost management of JN Electric Power Group, analyze the existing problems before, during and after the environmental cost, and finally propose solutions to improve the environmental cost management level of JN Electric Power Group, so as to enable JN Electric Power Group to move towards a more low-carbon and green sustainable development. For China to achieve the "double carbon" goal of the cause.

Keywords: "Double Carbon" Goal; Environmental Costs; Prior Environmental Cost Management; In-process Environmental Cost Management; Post-Environmental Cost Management

1. Introduction

With the continuous development of economy society. the contradiction between and economic development and natural environment has become increasingly prominent, and environmental problems have gradually become the focus of attention of all countries. In September 2020, China clearly put forward the goal of achieving "carbon

peak" in 2030 and "carbon neutrality" in 2060, that is, the "double carbon" goal, which is the two-stage goal of China's commitment to the world to reduce carbon dioxide emissions. It is based on the international responsibility of promoting the building of a community with a shared future for mankind and the vision of promoting the sustainable development of China's economy and society.

Power enterprises are usually one of the main sources of carbon emissions and environmental pollution, so they should take the initiative to assume social responsibilities, implement environmental actively cost management, and implement the awareness of environmental protection into the production process of enterprises by reducing energy consumption, improving resource utilization efficiency, reducing pollution emissions and other measures to reduce the negative impact on the environment. At the same time, the environmental cost management of power enterprises can help guide enterprises to change to green, low-carbon and circular production mode, so as to provide strong support for realizing the "double carbon" goal. Therefore, it is particularly important to study the environmental cost management of electric power enterprises under the goal of "double carbon".

At present, China's research on environmental cost management based on the "double carbon" goal is still in the exploratory stage. Domestic scholars believe that China's environmental cost management level is still insufficient, and enterprises should constantly improve the environmental cost management mechanism and actively reduce environmental costs. Hu believes that with the rapid economic development, environmental pollution and ecological damage have become the primary problems facing the world. Only by attaching importance to environmental cost management and control can environmental

costs be correct and conducive to the sustainable development of economy and society ^[1]. Zhang believes that enterprises with high carbon emissions should conduct in-depth research on the accounting and disclosure of their environmental costs, improve their environmental cost management level in a targeted manner, and constantly optimize their environmental cost control system [2]. Gao believes that the most important factor affecting environmental costs is production costs, and only by finding key pollution costs sources can environmental be fundamentally and effectively reduced. Enterprises with high pollution and high energy consumption should take the initiative to manage environmental costs ^[3]. Gu believes that the establishment and improvement of environmental cost accounting system and environmental cost management policies are of far-reaching significance to the healthy development of enterprises, and will help enterprises better manage and control environmental costs ^[4]. Zhou believes that environmental cost management and control is the core issue of environmental protection work, and effective environmental cost management can provide useful reference for realizing sustainable economic development^[5]. Ziyu believes that enterprises with high pollution emissions should gradually realize the importance of low-carbon economy for enterprise development, and enterprises should improve the environmental cost system and improve the disclosure of environmental cost information ^[6]. Zhang believes that enterprises should respond to the national call to reduce carbon emissions, do a good job in environmental cost management, and improve the current predicament of environmental cost management of chemical enterprises ^[7]. Chi believes that enterprises should accelerate the pace of low-carbon transformation, promote the implementation of energy conservation and emission reduction of enterprises with environmental cost management, and actively seek a new chapter of green development [8]. Wu believes that the substantive issue of carbon neutrality is the issue of energy. China should promote the sustainable use of energy, promote the transformation of traditional energy, and lay the foundation for the future development direction of energy and carbon emission reduction ^[9]. Chen believes that in

Copyright @ STEMM Institute Press

today's competitive market, in order to maintain competitive advantage, enterprises must find more efficient management strategies to control and reduce environmental costs and ensure the steady development of enterprises ^[10].

On the whole, domestic scholars mainly start from the perspective of medium and micro, based on the industry and enterprise development status of research and analysis. Domestic research results provide the basis for this study, but few research on the power industry. Therefore, based on previous studies, this paper will take JN Electric Power Group as an example to analyze the problems existing in the implementation of environmental cost management, analyze the causes, and propose improve the solutions to level ofenvironmental cost management, so as to find solutions for high-carbon emission power enterprises under the goal of "double carbon", effectively improve the level of environmental cost management, and achieve green development.

2. Analysis on Current Situation of Environmental Cost Management of JN Electric Power Group

JN Electric Power Group, full name is Beijing Jingneng Power Co., LTD., was established in 2000, listed on the Shanghai Stock Exchange in 2002, is the first power listed company in the capital, currently under the Jingneng Group, is a state-owned holding enterprise, its business scope covers thermal power generation, cogeneration, coal power joint venture, electricity sales, new energy power generation, integrated energy services, etc.

JN Electric Power Group environmental cost management is composed of Prior environmental cost management, in-process cost management environmental and post-environmental cost management. The following three aspects of JN Electric Power Group environmental cost management status is described.

2.1 Prior Environmental Cost Management

Prior environmental cost management refers to the related costs that enterprises must pay before formal production to reduce carbon emissions, including the preventive costs such as the training cost of skilled workers, the purchase of advanced machinery and the research and development design cost of products. The aim is to reduce environmental costs and resource consumption at source by preventing and reducing environmental pollution.

JN Electric Power Group deeply analyzed carbon emission policies and carbon market orientation, and compiled the "National Carbon Emission Trading (Power industry) Market Construction and JN Electric Power Carbon Management Group Emission Research Report", "Whole Process Energy Conservation Management of thermal power enterprises under the "Double carbon "goal", etc. The construction of energy saving management system of thermal power enterprises is introduced in detail, which provides decision-making basis for carbon emission management of thermal power enterprises, and also provides important reference data for index analysis of thermal power enterprises. Carried out "Low-carbon Day" online special training on carbon emission management improvement, organized 23 people from JN Electric Power Group Headquarters and affiliated enterprises to obtain the carbon emission Manager Certificate jointly issued by Beijing Green Stock Exchange and the Training Center of the Ministry of Human Resources and Social Security, and further improved the ability of carbon emission and carbon asset management.

2.2 In-process Environmental Cost Management

In-process environmental cost management is the cost related to the environment to be paid by the enterprise in the production process, including the purification of carbon emissions in the transportation process and the optimization of the process flow. Its purpose is to discover and solve the problems and deficiencies in environmental cost management in time through the monitoring and control of environmental costs, and improve the economic benefits of enterprises.

 Table 1. The Excess Carbon Emissions of

 JN Electric Power Group in 2020-2022 Unit:

 ton

ton							
Year	Sulfur dioxide	Nitrogen oxide	Smoke	Excessive emission condition			
2020	5766.371	10932.48	722.90	without			

http://www.stemmpress.com

2021	5378.42	10731.05	800.85	without
2022	5913.64	12134.79	887.80	without

Data source: Collected from the company's annual report of JN Electric Power Group for 2020-2022

2.2.1 Adhere to environmental technology innovation

JN Electric Power Group actively responds to the national "double carbon" goal, keeps forging ahead in technological innovation, and steadily promotes the implementation of the "double carbon" work. The "flow battery" technology laboratory was established, which was closely driven by "green & innovation", and the current efficiency was increased from 67.82% to 94.98%, and the energy efficiency was increased from 32.83% to 68.26%, and the core technologies such as the flow channel design, flow rate design and mass transfer uniformity inside the reactor have reached the leading level in the domestic industry.

On the 660MW unit, innovative research and development of lignite flue gas water extraction technology, more than 100 tons of water per hour, becoming the world's first power generation zero water intake unit. With wastewater cascade, urban water instead of surface water as production water, air cooling instead of water cooling, and zero discharge of desulfurization wastewater as the starting point, tens of millions of tons of water resources can be saved every year.

2.2.2 Strictly observe emission standards

JN Electric Power Group strictly implements the carbon emission standards stipulated by the state. The emissions of sulfur dioxide, nitrogen oxide and soot in 2020-2022 are shown in Table 1, and there is no excessive emission.

2.3 Post-environmental Cost Management

Post-environmental cost management is the cost of environmental restoration that enterprises have to pay after production, including the disposal of waste, the reuse of recyclable resources, the re-essence and the fine for polluting the environment. Its purpose is to manage and govern the environmental problems that have alreadv occurred. improve and optimize continuously the environmental cost management system, and improve the effectiveness and efficiency of environmental cost management.

In 2022, in order to implement and promote the "double carbon" action plan, JN Electric Power Group has established and improved the post-event feedback mechanism. Grassroots units according to the carbon emissions feedback of relevant departments, called on grassroots youth to carry out post-carbon emissions feedback activities of JN Electric Power Group, a total of 2374 employees participated, a total of more than 7,000 feedback comments, around the production and operation center work, in-depth research and thinking, and post-feedback, and actively promote the "double carbon" goal.

3. Problems Existing in Environmental Cost Management of JN Electric Power Group

3.1 The Existing Problems of Pre-environmental Cost Management

3.1.1 The fuel choices for power generation are not clean enough

The power generation form of JN Electric Power Group is thermal power generation, which is the most serious form of carbon pollution. Coal is the main raw material. In the process of coal-fired power generation, coal combustion will release a large number of harmful substances such as carbon dioxide, sulfur dioxide, nitrogen oxides and particulate matter, and at the same time, it will also produce a large amount of wastewater waste residue, causing serious pollution to water resources and land resources. In the past five years, the cost of coal-fired power generation has occupied a high proportion of operating costs in JN Electric Power Group, becoming the largest expenditure of operating costs. From 2018 to 2022, the coal cost of JN Electric Power Group accounted for more than 95% of the total cost, of which 98% in 2020 and 99% in other years.

3.1.2 The efficiency of power generation equipment is low

As the power generation form of JN Electric Power Group is thermal power generation, its power generation equipment mainly includes fuel supply system, water supply system, steam system, electrical system and some other auxiliary processing equipment. Equipment in the process of converting heat into electricity, there will be energy loss, in addition, in the power generation process requires a lot of water for cooling and steam generation, so the dependence on water sources is strong. This has brought difficulties to the power plants of JN Electric Power Group in the regions with relatively short water resources in northwest China, which need to be solved through the allocation of water resources, resulting in relatively low power generation efficiency.

3.2 The Existing Problems of In-process Environmental Cost Management

3.2.1 Equipment operation and maintenance costs are high

The power generation equipment maintenance costs of JN Electric Power Group mainly include fuel costs, equipment maintenance human resources costs costs, and environmental protection facilities operating costs. Thermal power generation mainly relies on the burning of fossil fuels and requires a large amount of coal and other fuels. In the past five years, coal prices have fluctuated and mainly showed an upward trend, which has a direct impact on operation and maintenance costs. Thermal equipment is a complex system, the maintenance and overhaul of each system requires professional knowledge and skills, and thermal power generation equipment to operate for a long time, equipment aging and wear is serious, which needs to pay a certain amount of equipment maintenance costs and human resources costs: With the implementation of the "double carbon" goal, JN Electric Power Group has correspondingly equipped professional environmental protection facilities, such as desulfurization and denitrification equipment, to meet the requirements of emission standards, which increases operating costs.

3.2.2 The power generation process is more complicated

JN Electric Power Group's thermal power generation process involves multiple systems and equipment working together, and its complex process is tantamount to increasing the associated environmental costs. First of all, it is the storage and preparation of coal. Although the power plant of JN Electric Power Group is close to the coal development site, in order to improve the combustion efficiency, the raw coal in the coal hopper will be further ground into pulverized coal by the coal mill, and coal resources will be consumed in this process. Secondly, coal combustion and steam formation, in the process of combustion will release a lot of carbon dioxide and other pollution gases; finally, it is the condensation and reuse of steam. The steam that has done work in the steam turbine will be condensed into water by the condenser. Due to the aging of the machine and equipment, it is usually impossible to reuse this part, which will lose some water resources. In addition, the process of thermal power generation also involves many auxiliary systems, such as combustion system, soda water system, electrical system, etc., these systems work together to ensure the stable operation of the entire power generation process.

3.3 The Existing Problems of Post-environmental Cost Management

3.3.1 Waste management and resource recovery efforts are not strong

JN Electric Power Group waste management and resource recovery is not strong mainly due to the treatment technology and management system. The waste treatment and resource recovery of thermal power plants need some technical support, including the technology of waste classification, treatment and recycling. However, at present, the thermal power plants of JN Electric Power Group distributed in the northwest of China have limited technical level in these aspects, resulting in poor waste treatment and resource recovery. In addition, waste management and resource recovery need to establish a sound management system, including waste classification, collection, transportation, treatment, recycling and other provisions, and JN Electric Power Group has not yet set up relevant departments or project teams for resource recovery management, but also lack of relevant technical personnel. These reasons led to the failure of JN Electric Power Group to do a good job of environmental cost management measures, in the past five years, JN Electric Power Group because of environmental safety and pollution problems have been administrative penalties.

3.3.2 The feedback synergy of environmental cost management is insufficient

The lack of feedback of JN Electric Power Group's environmental cost management will have a certain negative impact on environmental protection and sustainable development of enterprises. JN Electric Power Group lacks a sound feedback mechanism for environmental cost management, and only stays at the level of personal feedback, not rising to the level of enterprise decision-making management, and does not sort out and classify personal feedback opinions to form explicit regulations. The lack of communication and cooperation between different departments in the enterprise on environmental cost management leads to the lack of information flow. In the face of the emission of polluting gases and other behaviors of enterprises, there is no joint post-analysis with relevant departments, which fails to form an effective joint force to deal with environmental problems.

4. Countermeasures and Suggestions to Improve the Environmental Cost Management Level of JN Electric Power Group under the Goal of "Double Carbon"

4.1 Raise the Level of Prior Environmental Cost Management Countermeasures and Suggestions

4.1.1 Choose clean, high-quality power generation fuels

JN Electric Power Group coal-fired power generation will bring a lot of pollution gas emissions, in order to reduce the carbon pollution of coal-fired power generation, JN Electric Power Group can choose cleaner and high-quality power generation fuel. Clean, high-quality power generation fuels usually refer to those with low sulfur, ash and other harmful substances, such as high-quality coal, natural gas, liquefied petroleum gas and so on. These fuels produce fewer pollutants during combustion, reducing the environmental impact of coal-fired power generation. In addition, the use of clean, high-quality power generation fuels can also improve the energy efficiency of coal-fired power generation. High-quality fuels can release energy more fully when burned, improve power generation efficiency, reduce energy waste, and contribute to green development of the environment.

4.1.2 Update environmentally friendly and clean power generation equipment

The power generation equipment of JN Electric Power Group is still the traditional power generation equipment, not only the power generation efficiency is low, the maintenance cost is also high, therefore, the update of more environmentally friendly and clean power generation equipment is an important measure to respond to

environmental protection requirements. JN Electric Power Group should choose high-efficiency and low-emission equipment, such as clean energy power generation equipment such as gas turbines, wind turbines and solar photovoltaic equipment, which can significantly reduce the emissions of carbon dioxide, sulfur and other pollutants generated by coal-fired power generation equipment, and reduce the negative impact on the environment. At the same time, JN Electric Power Group should gradually phase out old and high-emission power generation equipment according to its own energy structure, market demand and environmental requirements, so as to ensure the stable operation of power generation equipment and the security of energy supply.

4.2 Raise the Level of In-process Environmental Cost Management Countermeasures and Suggestions

4.2.1 Evaluate and optimize equipment energy consumption

Energy consumption evaluation and optimization of equipment is an important means to improve energy utilization efficiency and reduce production costs. JN Electric Power Group should establish a sound energy consumption evaluation system, including the collection, sorting, analysis and evaluation of equipment energy consumption data. Through real-time monitoring and analysis of equipment energy consumption data, energy consumption anomalies and bottlenecks can be found in time, providing a basis for subsequent optimization work. It is necessary to adjust and optimize the parameters of equipment operation, such as adjusting the combustion parameters of the boiler and optimizing the operating conditions of the steam turbine. which can effectively reduce the energy consumption of the equipment, improve the fuel efficiency and promote sustainable development.

4.2.2 Optimize the power generation process

The power generation process of JN Electric Power Group is a traditional process, which is relatively complex and inefficient. Optimizing the power generation process can effectively improve the power generation efficiency and reduce energy consumption. First of all, JN Electric Power Group should conduct a comprehensive analysis of the existing power generation process, find out the bottleneck in the process, and conduct а detailed investigation and research on the operation status of each process link, energy consumption, waste discharge and other aspects. Secondly, it is necessary to determine the objectives of optimization and ensure that these objectives are consistent with the overall development strategy and environmental requirements of the enterprise. Finally, JN Electric Power should actively implement circular comprehensive economy and utilization of resources, recycle and treat waste, and turn waste into treasure. For example, the comprehensive utilization of fly ash, desulfurized gypsum and other wastes can reduce environmental pollution and create economic value.

4.3 Raise the Level of Post-environmental Cost Management Countermeasures and Suggestions

4.3.1 Strengthen waste cleaning and resource recycling efforts

Strengthening waste cleaning and resource can significantly reduce recycling the emissions of pollutants generated during power generation and reduce the negative impact on the environment. The waste generated by JN Electric Power Group in the process of power generation shall be classified according to its nature, such as combustible waste, non-combustible waste, hazardous waste, etc. Establish a reasonable waste collection system to ensure that all kinds of waste can be collected accurately and timely. For the collected waste, JN Electric Power Group should take appropriate treatment methods, such as incineration, landfill, chemical treatment, etc. At the same time, strengthen the recovery of resources, the recyclable waste for reuse, such as fly ash can be used as building materials, desulfurization gypsum can be used for the production of gypsum products.

4.3.2 Standardize the feedback mechanism of environmental cost management

The feedback mechanism of JN Electric Power Group is obviously far from enough to stay at the individual level, and it should set up a special environmental cost management organization or department, responsible for the overall management and coordination of the enterprise's environmental cost work, collect,

collate and analyze environmental cost data, regularly report the environmental cost situation to the senior management of the enterprise, and put forward suggestions for improvement. Strengthen the communication and cooperation between various departments to ensure the smooth progress of environmental cost management. In addition, JN Electric Power Group can introduce a third-party assessment and supervision body to evaluate and supervise the environmental cost management work, which helps to find potential problems and put forward suggestions for improvement, and improve the level and effect of environmental cost management.

5. Conclusion

Under the background of global climate change problem is increasingly serious, China's proposed "double carbon" goal is a necessary choice to realize sustainable development. This paper takes JN Electric Power Group, a high-carbon emission enterprise in the power industry, as the case study object, analyzes the current situation of its environmental cost management, and finds that the effective implementation of environmental cost management is of great practical significance for power generation enterprises to move towards high-quality green development. It is hoped that this study on the environmental cost of JN Electric Power Group can provide inspiration for enterprises with high carbon emissions, help enterprises improve their environmental costs, allow enterprises to take into account economic development and green transformation and upgrade simultaneously, and provide help for realizing the goal of "double carbon".

Acknowledgements

This work was supported by the Talent Introduction Project (number: ZW2025) of Lingnan Normal University and by the project (number: 20233L02) of Guangdong Coastal Economic Development Research Center.

References

[1] Ying Hu. A Brief discussion on Environmental cost management and control in environmental Responsibility. Times Finance, 2014, (03):316-326.

- [2] Qixiang Zhang. Oil on problems and countermeasures of enterprise environment cost management. Journal of China Petroleum and Chemical Industry Standard and Quality, 2018, 38 (01): 70-72.
- [3] Rong Gao. Cement enterprise environment cost management research. Yunnan University of Finance and Economics, 2022, (10): 25-28.
- [4] Qiangping Gu, Jiongyu Zhou. Research on environmental cost management of A coal company under product life cycle. Inner Mongolia Coal Economy, 2024, (01):88-90.
- [5] Xinjun Zhou, Xiaofang Yang.Research on environmental cost management and control under the background of double carbon target. Shandong Textile Economy, 2023, 40(10):27-31.
- [6] Ziyu He, He Gao. Research on environmental cost management of paper industry under the background of low-carbon economy. Finance and Accounting Learning, 2023, (22):104-106.
- [7] Xinsheng Zhang. Environmental cost management of chemical enterprises under the "double carbon" goal. Cooperative Economics and Science and Technology, 2022, (21):30-31.
- [8] Xuehua Chi, Fei Dai. Research on Environmental cost Management of manufacturing enterprises in Jiangsu Province under the dual-carbon target. International Business Finance and Accounting, 2023(02):28-31.
- [9] Yuqing Wu, Songhe Wen, Guowei Zhu et al. Research on sustainable Energy utilization Theory and cost accounting of thermal power plant under the background of carbon neutrality: A case study of a thermal power plant in a city. Environmental Ecology, 2022, 4(04):39-44.
- [10] Yaxin Chen. Research on Enterprise Sustainable development cost Management based on environmental perspective. China Collective Economy, 2024, (13):49-52.