Discussion on Fulfilling the Responsibility of Marine Protection by Nuclear-related Enterprises

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Abstract. A conclusiveness part of Marine pollution is unreasonable nuclear waste disposal. Therefore, the research theme of "Whether nuclear power enterprises should fulfill their corporate social responsibilities and protect the Marine environment" was established. Through comparative analysis of different nuclear power enterprises' methods to boost development and measures to deal with venture, meanwhile, combined with relevant knowledge of corporate social responsibility, the authors concluded that nuclear power enterprises perform Marine protection responsibility could directly protect the Marine environment and protect its most basic resources, which is conducive to the sustainable and stable development of nuclear power enterprises. In the end, the authors discussed the future direction. The research proposes a diversified governance plan, authors of this research connected nuclear power enterprises with other players in the market, explored the most effective way to supervise nuclear power enterprises to fulfill their responsibilities. And they provide constructive suggestions for the future transformation of nuclear power generation and multiple players interact with each other's to protect the environment.

Keywords: Nuclear-related enterprises; Japan's Tokyo Electric Power Company; China's Liaoning Electric Power Company Limited; Corporate Social Responsibility; Marine Pollution.

1. Introduction

The main causes of Marine pollution are land-based pollution and ship pollution. Among the pollutants, the leakage of nuclear power plants in land-based pollution is the biggest source of pollution, and the leakage of coastal nuclear power plants will directly lead to the nuclear-contaminated water polluting the oceans. Due to the fact that seawater cooling can reduce the costs of cooling the nuclear reaction, most companies will choose to locate their plants in the sea, so the nuclear power generation will produce a large amount of waste water containing radioactive isotope, namely for cleaning, dust, desalination, the purpose of low radioactive, or after treatment still contains trace radioactive material of nuclear waste water. The nuclear wastewater is not directly in contact with radioactive materials, so the concentration of radioactive materials is low. After strict treatment, this kind of water will not cause serious pollution to the ocean. However, if the nuclear waste water that is not properly treated or the highly radioactive nuclear contaminated water that is in direct contact with the radioactive materials in the nuclear reactor in the nuclear accident enters the sea, it will cause serious pollution to the sea. Marine resources some of the most important resources in people's life. Proper management of nuclear waste and nuclear pollutants is crucial to the sustainable utilization of nuclear energy and environmental health [1]. Therefore, once coastal nuclear power plants irresponsibly discharge nuclear waste such as nuclear wastewater that has not been strictly treated into the sea, or cause nuclear power plant leakage due to their own technical or management errors, it will pose a direct threat to the safety of Marine resources.

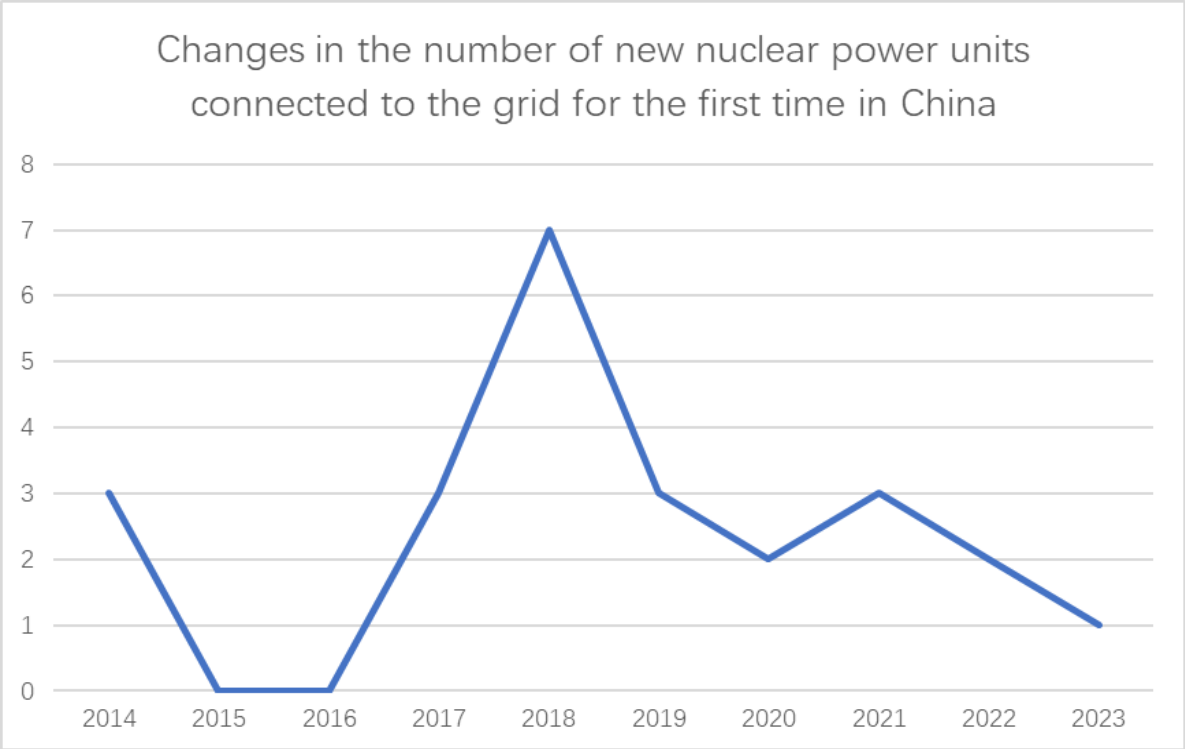

Figure 1. Changes in the number of new nuclear power units first connection to the grid in China.

In recent years, nuclear power enterprises have developed rapidly. In China, for example, as of 2023, another new nuclear power unit has been the first connection to the grid. The world nuclear power industry is also in the development stage, with studies indicating that nuclear power being recognized is the most viable source of power generation in the next 50 to 100 years [2]. However, along with the development of the nuclear electric power industry, some nuclear power enterprises simply pursue economic benefits, resulting in irresponsible treatment of nuclear waste and even nuclear pollutants. For example, on April 13,2021, the Japanese government has decided to drain all the waste water from the Fukushima Daiichi plant into the waters near the plant, and officially discharged the nuclear waste water on August 24,2023(In particular, it should be pointed out that Japan's discharge this time is not the "nuclear wastewater" discharged during normal operation of specially treated nuclear reactors at nuclear power plants, but the nuclear-contaminated water used to forcibly cool down the severely damaged molten core in the treatment of the earthquake and tsunami caused that on March 11,2011, a factory nuclear accident occurred at the Fukushima nuclear power plant in Japan. These cooling water will carry more than 200 kinds of strong radioactive isotopes that are highly toxic to organisms, which is essentially different from the nuclear wastewater generated during the time that the nuclear power plant is in normal operation, and poses a fatal threat to humans and even all living things. Therefore, in this article, the term nuclear-contaminated water will be used in accordance with the facts in relation to the incident in Japan.). Another example is in 2023, the nuclear power plant which located on the coast of South Korea discharged heat from seawater used for cooling without strict treatment, negatively affecting the Marine environment and causing complaints from local fishermen [3]. These irresponsible actions, which directly polluted and destroyed Marine resources, have aroused great dissatisfaction among Pacific coastal countries, and stimulated the discussion on whether nuclear power enterprises should fulfill their corporate social responsibility to a climax. In recent years, new progress has been made in the improvement of pollutant treatment technology in nuclear power enterprises. The thermal nuclear cogeneration system has effectively complemented the power generation efficiency and pollutant emission reduction, while reducing the emission of nuclear pollution [4]. This technological innovation indicates that nuclear power enterprises may provide power for the transformation of the traditional energy industry in the future, and also reflects that the security of the energy industry for nuclear power supply will

become a necessary requirement for nuclear power enterprises to improve economic benefits and capture the market. Therefore, the report will target at the problem which is “Whether nuclear power enterprises should fulfill the responsibility of Marine environmental protection”, comparing the Tokyo electric power company and China's LiaoNing Electric Power Company Limited in terms of their measurements in the face of potential Marine pollution measures. Utilizing the relevant knowledge of corporate social responsibility, this report will use the method of comparative analysis and evaluate the development results of two enterprise, it is concluded that nuclear power enterprise is necessary and should protect the environment, protect the responsibility of Marine resources the final conclusion. The conclusion of this study is a theoretical opinion on whether nuclear power enterprises should incorporate the corporate social responsibility of environmental protection into the basic requirements of corporate development.

2. Comparison

The study selected Japan's Tokyo Electric Power Company and China's LiaoNing Electric Power Company Limited, both of which have larger nuclear plants on the coast and produce comparable amounts of electricity. Another reason to choose them is they faced with the same problem, which is about disposing of nuclear waste or nuclear contaminants. The authors establish a comparative analysis of the two companies' different approaches and attitudes towards nuclear waste disposal in the early stages of the production process.

2.1. Japan's Tokyo Electric Power Company

In Japan and even the world, The Tokyo Electric Power Company is the largest private power company. While continuously expanding production capacity to generate income, it has also been at the center of public opinion because of its irresponsibility to residents' health and environmental safety, and economic compensation has been continuous. The following passages give three incidents of Tokyo Electric Power Company are selected for relevant analysis.

On July 18, 2007, Tokyo Electric Power Company issued a statement admitting that it had underreported the amount of radioactive material in the radioactively contaminated water that leaked into the ocean after the Kashiwazaki-Kariwa nuclear power station earthquake for the first time. The contaminated water that leaked into the sea after the earthquake has 90,000 Beck radiation (radioactive activity unit), which was 50% higher than previously reported. And the data side-fact indicates that Tokyo Electric Power Company had not reasonable treated the nuclear-contaminated water in effective time. Otherwise, the radiation concentration should not be so high. So far as to, before the release of the real data, Tokyo Electric Power Company continued to work normally and did not take corresponding measures to deal with such serious nuclear pollution. To a certain extent, this concealing behavior shows that Tokyo Electric Power Company pursues profits first and is not responsible to society, and directly causes large-scale sea water pollution. After learning the real situation of this incident, Kashiwazaki City Mayor Hiroshi Aida said immediately that he will not approve the restart of the nuclear power plant until the safety is confirmed, because the nuclear power plant facilities may still have safety risks. Nuclear power plants cannot start to generate electricity to generate income, while the need for a large number of maintenance costs, Tokyo Electric Power Company must bear huge economic losses. At the same time, the Company's revenue performance in the year under review was poor due to weak revenue growth resulting from downtime and maintenance, which makes the company's resilience to fund the steady growth of future earnings unable to grow and meet. In the 2010 financial report, it announced a net loss of 1.25 trillion yen (about 15 billion US dollars), the largest loss in a single financial year for a Japanese non-financial insurance company. The shutdown of enterprises, coupled with huge losses, indicates to a certain extent that enterprises can maximize the overall social benefits only by balancing the three aspects of economy, environment and society, and fulfilling corporate social responsibility can improve the balance performance of enterprises [5].

In the March 11, 2011 earthquake off Honshu Island, Japan, Tokyo Electric Power Company caused a major nuclear leakage accident due to the technical constraints of power generation and poor maintenance in a good while. Tokyo Electric Power that owns the Fukushima Daiichi nuclear power station that was damaged in the earthquake, is struggling to pay huge compensation. Apart from Tokyo Electric Power's own nuclear power disposal fund, the huge amount of compensation makes government intervention inevitable, otherwise Tokyo Electric Power will face the problem of bankruptcy, but Tokyo Electric Power is exactly a "too big to fail enterprise", on the one hand has the largest power generation in Japan, on the other hand supports the national economy of Japan [6]. Related agricultural losses as stock prices fall. The people who are shielded from nuclear power leakage, the operators who are exposed to danger, and the subsequent treatment of nuclear waste and nuclear sewage are all faced with sky-high compensation that enterprises cannot afford [6]. Although natural disaster is the direct cause of this accident and is accidental, the root cause - Tokyo Electric Power Company's long-term poor maintenance cannot be ignored, and the enterprise's irresponsible attitude towards society and the environment is also clearly revealed, so the compensation and other economic losses are still mainly borne by the company.

On April 15, 2021 (April 13 local time), the Japanese government held a cabinet meeting and officially announced that the decision to discharge Fukushima radioactive wastewater into the ocean has also adversely affected the company's economic benefits, the latest data show that: In fiscal year 2022, the company reported revenue of 5,309,924 million yen, compared to 5,866,824 million yen in fiscal year 2021, a decrease of 9.5 percent. The decline in revenue was led by a 12.3% decline in sales in the Energy Partners segment and a 40.8% decline in sales in the Fuel and power segment [7]. The decline in sales could not be ruled out as a result of a loss of consumer confidence in businesses. The decline in TEPCO's revenue potential is obvious and long-lasting.

On August 24, 2023, at 13:00 local time in Fukushima, Japan, Tokyo Electric Power Company officially discharged nuclear-contaminated water from the Fukushima Daiichi nuclear power plant into the Pacific. Since the Fukushima nuclear disaster occurred, the company and the government have taken a negative attitude towards the aftermath of the disaster, which has triggered a reconsideration of the so-called "risk society" issue by Ulrich Beck [8]. In particular, the nuclear-contaminated water discharge plan proposed by Tokyo Electric Power Company of Japan linked the nuclear menace of the installation country with the Marine environmental risk and the stability of the Marine economy of neighboring countries and even the all mankind [8]. This raises a number of potential threats to the Marine environment and also raises the question of justice as to who bears the environmental and economic risks and responsibilities [8]. This irresponsible plan has even been put into practice, which fully demonstrates Tokyo Electric Power Company's irresponsibility for the Marine economy and environment of its own country and even the world.

To sum up, TEPCO's failure to fulfill its social and environmental responsibility has caused huge losses: not only direct economic compensation, but also a loss of social credibility, which affects long-term stable development.

2.2. China's LiaoNing Electric Power Company Limited

China's LiaoNing Electric Power Company Limited, which also owns nuclear power generation technology and is in power supply state. Due to the particularity of nuclear power plants, their safe and stable operation requires a large amount of safe and reliable freshwater water source as a guarantee, while the water source of the construction of nuclear power plants is subject to seasonal and climatic changes, and the large amount of fresh water supply of nuclear power plants cannot be effectively guaranteed in the drought and water shortage. Therefore, desalination technology has become one of the effective ways for coastal nuclear power plants to solve freshwater water sources [9]. However, the high salinity wastewater generated by seawater desalination will become one of the wastes, and the radiation waste will also face the same difficulties. However, LiaoNing Electric Power Company Limited has not chosen to ignore the problems of environmental protection and use relevant technologies. 2 waste solution collection pools are set up in the water desalination system to collect

concentrated brine, reverse osmosis cleaning water and other wastewater [9]. The system is equipped with 4 vertical self-priing pumps, and the overflow parts are all double-phase stainless steel resistant to seawater corrosion [9]. The flow rate of single pump is 600m3/h, and the head is 20m, so as to ensure the collection efficiency of large flow to ensure maximum leakage prevention [9]. In order to ensure that the concentrated brine excluded is not harmful to Marine life and ecological environment, Haiyang nuclear power plant entrusted by Marine university of China to conduct a mathematical model analysis on the discharge of concentrated brine in seawater desalination reverse osmosis plant [9]. According to the analysis results, the seawater desalination brine was mixed with circulating water and diluted water, and the reverse osmosis membrane rinsed water and other waste liquid containing acid and alkali were transported to the DTS wastewater neutralization tank after cleaning water, and the water was discharged uniformly after mixing and reaching the standard [9]. China's LiaoNing Electric Power Company Limited as achieved technological progress and innovation in maximizing environmental protection, laying a solid foundation for future income stability and competitiveness. Comprehensive comparison

3. Discussion

The Marine environmental protection responsibility discussed in this paper is a typical representative of corporate social responsibility. In the analysis, the CSR is divided into two aspects, not only environmental protection, but also data authenticity

In terms of data authenticity, Tokyo Electric Power Company (TEPCO) misrepresented the radiation content of the wastewater leaked from the Kashiwazaki-Kariwa nuclear power plant after the earthquake, and its real radiation content increased by 50% compared to the previous public data, whereas China's Liaoning Electric Power Company Limited (Liao Ning Power Company Limited) did not ignore the real data, and its subordinate marine nuclear power plant commissioned Ocean University of China (OUC) to conduct a mathematical modeling test analysis on the discharge of concentrated brine from the desalination Ltd. has commissioned Ocean University of China to conduct a mathematical modeling test and analysis of the discharge of concentrated salt water from the reverse osmosis unit, and has made the analysis data available to the public. In the end, TEPCO's withholding of data and failure to take timely measures to deal with nuclear contamination led to a ban on the restart of its nuclear power plants by the local government, resulting in heavy economic losses for the company. However, China's LiaoNing Electric Power Company Limited treats data in the principle of seeking truth from facts, and goes further to improve and analyze data and fulfill social responsibilities, which has won respect in the market and the respect of the government, an important stakeholder. Depending on the nation, the government can utilize a variety of strategies to promote CSR as they are significant stakeholders in the field [10]. Both governments and markets are two major drivers of economic development in emerging markets. When companies suffer negative reputational (rather than economic) shocks, government involvement can insulate some specific companies (CGSOEs) from negative impacts [11]. Therefore, China's LiaoNing Electric Power Company Limited has won more long-term benefits

In terms of environmental protection, Tokyo Electric Power Company (TEPCO) withheld data and did not take appropriate measures to deal with the situation, resulting in extensive nuclear contamination of the sea, and later, during the earthquake in the waters of Honshu Island, Japan, TEPCO caused a major nuclear leakage due to prolonged and ineffective overhauling, which seriously contaminated the marine environment. However, China Liaoning Electric Power Co., Ltd. not only did not cause any nuclear leakage, but also took the high salinity wastewater produced by desalination seriously by setting up waste liquid collection ponds to ensure the rate while preventing the waste material from being polluted.

In summary, both data authenticity and environmental protection are subordinate to one aspect of CSR, which shows that the fulfillment of CSR by enterprises is more beneficial to their own development in the long run. Additionally, mandated vs voluntary CSR disclosure has varied

detrimental effects on a company's profitability, with the former being more effective [12]. Despite the government's requirement for mandated CSR disclosure, management can signal the market through voluntary CSR disclosure [12]. When companies have better governance and less financial constraints, the negative impact of voluntary disclosure on profitability is minimized [12]. Therefore, the initiative of enterprises to assume social responsibility will be more conducive to the development of enterprises.

4. Conclusion

The implementation of corporate social responsibility (CSR) by enterprises is too homogeneous if it starts from enterprises alone, which is not conducive to the full utilization of social resources and lacks supervision. Therefore, this study has come up with a multifaceted structure for the way nuclear power enterprises fulfill their responsibility for marine protection.

Studies on multifaceted cooperative governance have only given enterprises the responsibility to participate in environmental governance in general but have not systematically analyzed the motivating factors for enterprises, which have the dual roles of "market subject" and "environmental governance subject", to assume the responsibility for environmental governance. Therefore, further research can be conducted from two interrelated dimensions:

First, from the perspective of enterprises as the "passive party", to study whether it is necessary for the government to restrain enterprises from assuming the responsibility of marine environmental governance; second, from the perspective of enterprises as the "active party", to study whether they are willing to assume the social responsibility of marine environmental governance and how they should do so. Secondly, from the viewpoint of enterprises as the "active party", it will be studied whether they are willing and how they should undertake the social responsibility of marine environmental governance.

The former dimension is a natural extension of the more traditional study of dominant governmental responsibility for marine environmental governance by introducing the theory of governmental regulation into the study of marine environmental governance.

The latter dimension is the introduction of the theory of corporate social responsibility into the governance of marine environmental research, which is an expansion and deepening of the research on the responsibility of the main body of corporate water environmental governance, which has been less addressed in the past.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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