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Research on Resource Integration and Enterprise Performance of China Construction Environmental Energy's Reverse Mixed Ownership Reform

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Abstract: ***This article explores the resource integration and corporate performance issues of China Construction Environmental Energy through the introduction of China Construction Qiming for reverse mixed ownership reform. As a private enterprise in the environmental protection industry, China Construction Environmental Energy faces challenges such as difficult financing and intensified market competition. By introducing strategic investors with state-owned background through reverse mixed ownership reform, it effectively expands financing channels, enhances financial strength, and improves market competitiveness and brand influence. The article provides a detailed analysis of China Construction Environmental Energy's resource identification, acquisition, and integration strategies in the mixed ownership process, as well as the positive impact of these strategies on the company's financial performance, market performance, innovation performance, and governance performance. The research results indicate that reverse mixed ownership significantly enhances the comprehensive strength and market value of China Construction Environmental Energy.***

Keywords: China Construction Environmental Energy, Reverse mixed reform, Resource integration, Business performance**.**

1. Introduction

Private enterprises suffer discrimination in terms of credit, and financing costs are higher and more difficult to obtain than state-owned enterprises of the same size. In addition, the combination of tax incentives for SOEs, relatively low corporate social responsibility, asymmetric access to information, and a freer but more challenging market regulatory environment for private enterprises has led to a disadvantage for private enterprises in the market. Private enterprises are also facing challenges such as difficulty in repayment, structural adjustment, and resource constraints, and there is great uncertainty in their survival and development prospects, so China's business environment still needs to continue to improve.

In 2013, the "Decision" adopted by the Third Plenary Session of the 18th Central Committee of the Communist Party of China proposed to vigorously develop the mixed-ownership economy, which triggered heated discussions on the mixed-ownership reform of state-owned enterprises. Since then, many state-owned enterprises have introduced non-state-owned capital, forming a "positive mixed reform"; At the same time, private enterprises have also introduced state-owned assets to achieve "reverse mixed reform". In 2019, Premier Li Keqiang put forward the principle of "competition neutrality" in the "Government Work Report", requiring that all types of ownership be treated equally in terms of factor acquisition, operation and operation, access and licensing, etc., aiming to build a fair competition mechanism and restrain and adjust the market distortions caused by monopoly and policy tilt of state-owned enterprises. In recent years, the state has promulgated a series of policies to encourage the development of the private economy, emphasizing fair competition in financial policies and not setting discriminatory requirements for private enterprises. In this context, private enterprises ushered in development opportunities. In order to alleviate the plight of private enterprises, General Secretary Xi Jinping has proposed six major measures to bring good news to private enterprises, as well as new opportunities and challenges for state-owned enterprises. The central and local governments at all levels have actively responded to the policy and helped enterprises alleviate business pressure and crises by investing in private listed companies, and jointly promoted the healthy development of China's economy.

2. Overview of the Case of Reverse Mixed Reform of China Construction Environmental Energy

2.1 The Reverse Mixed Reform Process of China Construction Environmental Energy

CSCEC's "reverse mixed reform" has gone through three stages. First of all, in the preparatory stage, due to internal and external factors, the controlling shareholder Huaneng Demei announced in September 2018 that it was seeking external investment. Then, entering the stage of selecting strategic investors, in October, China Construction Huaneng and China Construction Group Investment Management Platform China Construction Qiming reached an equity transfer agreement, transferring 183 million shares (accounting for 27% of the shares) to China Construction Qiming, and China Construction Qiming became a major shareholder. The agreement was subsequently approved by the State-owned Assets Supervision and Administration Commission of the State Council. Finally, entering the implementation stage, in January 2019, the equity transfer was completed, and CSCEC Qiming officially held 27% of the shares of CSCEC Huaneng and intervened in its related business. At this point, China Construction Environmental Energy began to transform into a mixed-ownership enterprise, and the "reverse mixed reform" was initially completed.

2.2 Causes of the Reverse Mixing of China Construction Environmental Energy

2.2.1 Conform to policy orientation

In the early days, CSCEC's customers were mainly concentrated in the metallurgical industry, but with the continuous technological innovation and rapid business expansion, its water environment treatment business has spanned many fields. However, the number of competitors has increased, and the price competition has become increasingly fierce. The introduction of shareholders with state-owned enterprise background can open up more resource channels for China Construction Environmental Energy. At the same time, the new technologies continuously developed by the company are fully qualified for the needs of national projects and help the diversified development of enterprises. The addition of state-owned equity will enhance the company's ability to obtain resources, while the company's own technical advantages can ensure the effective use of resources, and the two sides will complement each other. In recent years, the number of PPP projects has increased, the market competition has become more and more fierce, and the project normative requirements have become stricter. As a private enterprise in the environmental protection industry, China Construction Environmental Energy has limited access to resources. In order to stand out from the fierce competition and obtain more high-quality resources, the company cooperated with Zhongjian Qiming, a large state-owned enterprise, to complete the mixed ownership reform, in order to achieve better development with the support of the state.

2.2.2 Alleviate financial pressure

Since its listing, CSCEC's business has expanded rapidly, but it has a single financing channel and mainly relies on short-term bank loans and equity pledges, which is difficult to meet the growing demand for funds. The credit crisis in the environmental sector has slowed project progress and limited expansion. The two PPP projects undertaken by the company before the mixed reform had large investment and long term, slow cash collection, and sudden increase in financial pressure. Since the end of 2018, state-owned capital has begun to enter the field of environmental protection. China Construction Environmental Energy timely introduced state-owned capital such as China State Construction Group to bring new vitality to the company. Relying on the strong strength and background of China State Construction Group, the financing function of China State Construction Environmental Energy has been enhanced, and the financing channels have been expanded, which has effectively solved the dilemma of the company's financing difficulties and laid a solid foundation for sustainable development.

2.2.3 Enhance the company's reputation

Before the mixed reform, China Construction Huaneng fell into litigation due to the contract dispute between the controlling shareholder Huaneng Demei and Shanghai Dadu Assets, and the company's stock price fell continuously, and the litigation information was not disclosed in a timely manner, which damaged the company's reputation. After the introduction of China State Construction Group, a strategic investor with a state-owned enterprise background, the company has received strong support, which will help to save its image. CSCEC enjoys a good reputation in the environmental protection industry, has established close cooperation with many units, and has accumulated rich customer resources and trust. After the mixed reform of private enterprises, relying on the reputation and strength of state-owned enterprises, it can further enhance the trust of the people in the company, lay a more solid foundation for the sustainable development of the company, and enhance market competitiveness.

3. Resource Integration of China Construction Environmental Energy Reverse Mixed Reform

3.1 Key Points of Resource Integration of Enterprise Mixed Reform

Resource integration needs to identify stakeholders and their interests, build a win-win mechanism, and maintain long-term trust and cooperation. Private enterprises should appropriately introduce state-owned capital according to their strategic intentions; Both parties need to identify their respective advantageous resources and gaps, and determine how to obtain resources; Based on the preliminary analysis, private enterprises need to integrate the resources of state-owned enterprises, realize complementary advantages, and move from "state-owned assets emergency relief" to "coordinated development".

3.2 Resource Identification and Analysis

As a private enterprise in the environmental protection industry, CSCEC has advanced technology, rich project experience, professional team and good market reputation and other advantageous resources. These resources are the cornerstone of CSCEC's foothold and development in the field of environmental protection. Although CSCEC has made certain achievements in the field of environmental protection, there is still a certain resource gap in the face of fierce market competition and changing market demand. For example, there is a shortage of funds, insufficient market expansion capabilities, and brand influence needs to be improved. These resource gaps limit the further development of CSCEC.

China Construction Environmental Energy first sorted out its own resources in detail, clarified its own advantages in environmental protection technology, project experience, market reputation, etc., and also clearly recognized the resource gaps in capital, market expansion, brand influence, etc. In order to fill these gaps, China Construction Environmental Energy began to actively look for suitable strategic investors. When identifying strategic investors, China Construction Environmental Energy not only considers the financial strength of investors, but also pays more attention to the resource network and brand influence behind them. Through market research and stakeholder analysis, CSCEC Huaneng finally identified CSCEC Qiming as a strategic investor [1]. As the investment management platform of China State Construction Group, CSCEC Qiming not only has strong financial strength, but also has rich project experience and resource network in the field of environmental protection. According to the annual report data, after the introduction of China Construction Qiming, the financial

strength of China Construction Environmental Energy has been significantly enhanced [2]. CSCEC Qiming's shareholding has brought more financing opportunities and lower financing costs to CSCEC, effectively alleviating the company's financial pressure. At the same time, CSCEC Qiming also provided strong support to CSCEC in terms of market expansion and technical support, helping the company rapidly expand its market share and enhance its brand influence.

3.3 Resource Acquisition Analysis

When CSEC carries out the reverse mixed reform, resource acquisition has become a key part of the implementation of its strategy. Through in-depth analysis of the company's financial situation and business needs, CSCEC has clarified the goals and paths of resource acquisition, and has taken a series of effective measures to enhance its own strength.

In the process of resource acquisition, CSCEC Huaneng first successfully introduced CSCEC Qiming as a strategic investor through equity transfer. This equity transfer not only brought much-needed financial support to the company, but also introduced the strong state-owned enterprise background of China State Construction Group, which laid a solid foundation for the subsequent resource integration and business expansion of China Construction Environmental Energy. According to the data, China Construction Qiming acquired 27% of the shares of China Construction Environmental Energy by cash payment and became the company's largest shareholder, which directly enhanced the capital strength of China Construction Environmental Energy. In addition, CSCEC has further consolidated its cooperative relationship with CSCEC Qiming by changing its controlling shareholder, restructuring its board of directors and introducing management [3]. CSCEC Qiming not only brought capital, but also brought advanced management experience, technical resources and broad market channels. Through the integration of these resources, CSCEC has been able to make significant progress in technology research and development, market expansion, project operation and other aspects. Specifically, after the introduction of China Construction Qiming, the financing channels have been effectively broadened, not only obtained more bank loans and green bond financing qualifications, but also established close cooperative relations with China Construction Finance and China Construction Financial Leasing Company, which further reduced financing costs and improved the efficiency of capital use. At the same time, the investment in technology research and development has also continued to increase, and the number and quality of the company's patent applications have been significantly improved, laying a solid foundation for the company's long-term development.

3.4 Resource Integration Analysis

The resource integration analysis of CSCEC's reverse mixed ownership reform is a key link in its successful transformation and performance improvement. Through in-depth analysis of the company's resource status and market demand, CSCEC has developed a systematic and comprehensive resource integration strategy.

In the process of resource integration, China Construction Environmental Energy first focuses on the integration of financial resources. By introducing CSCEC Qiming as a strategic investor, CSCEC has not only received much-needed financial support, but also significantly broadened its financing channels. The data shows that after the mixed reform, the bank credit financing capacity of China Construction Environmental Energy has been significantly enhanced, and the long-term credit borrowing has increased significantly, which has effectively alleviated the company's financial pressure. At the same time, CSCEC has also successfully obtained the qualification of green bond financing, which further reduces financing costs and improves the efficiency of capital use. In terms of the integration of market resources, with the help of the background of state-owned enterprises of China Construction Qiming, China Construction Environmental Energy has successfully established stable cooperative relations with a number of government agencies and large state-owned enterprises, which has significantly improved the ability to obtain projects. In addition, China Construction Environmental Energy has further broadened its market layout and enhanced its market competitiveness through the joint establishment of a company to operate its business. In terms of the integration of organizational resources, China Construction Environmental Energy has reorganized the board of directors and the board of supervisors, introduced state-owned enterprise managers with rich management experience and professional skills, and significantly improved the level of corporate governance. At the same time, the company has also strengthened the party building work, given full play to the political leading role of the party organization, and provided a strong political guarantee for the company's development [4]. In terms of the integration of technical resources, CSCEC actively integrates the advanced technology resources brought by CSCEC Qiming, increases R&D investment, and enhances the company's technological innovation capabilities. The data shows that the number and quality of patent applications of CSCEC Environmental Energy have been significantly improved after the mixed reform, laying a solid foundation for the company's long-term development.

4. The Impact of Resource Integration on Enterprise Performance after the Reverse Mixed Ownership Reform of China Construction Environmental Energy

4.1 The Impact of Resource Integration on Financial Performance after the Reverse Mixed-ownership Reform of China Construction Environmental Energy

4.1.1 The impact path of resource integration on financial performance after the reverse mixed-ownership reform of China Construction Environmental Energy

The holding of state-owned equity by enterprises can deepen the relationship between government and enterprises and bring external economic effects, and the introduction of state-owned equity is a strategy to strengthen this linkage. The implementation of "reverse mixed reform" can optimize resource allocation, broaden financing channels, strengthen government support, and improve the financial performance

of enterprises. Compared with private enterprises, state-owned enterprises have more advantages due to government credit financing. When private enterprises face a shortage of funds, they can expand financing channels through the state-owned capital platform. At the same time, state-owned enterprises are open to private enterprises for financing, promoting strategic transformation and helping the development of private enterprises. Government support policies reduce the tax burden on private enterprises, increase non-operating income, and provide financial guarantee for the expansion of reproduction and continuous operation.

4.1.2 Financial Analysis

On the one hand, the return on equity is a key indicator to measure the operating efficiency of an enterprise. It can be seen from the Table 1 that before the introduction of state-owned capital, this indicator was low and showed an overall downward trend, but after the release of the mixed reform news in 2018, it increased significantly, thanks to the improvement of the management's ability to interpret policies, the strengthening of government support and the acquisition of high-quality projects, which improved the market position and operating income. During the same period, the performance of environmental protection private enterprises declined due to the impact of PPP rectification, but China Construction Environmental Energy rose against the trend, and the return on net assets far exceeded the industry average, showing the positive impact of mixed reform. In 2019, the industry will pick up, and China Construction Environmental Energy will still maintain a profit advantage of 3-5 percentage points. In addition, its operating profit margin increased slightly after the mixed reform, thanks to technological innovation to reduce the operating cost of environmental protection projects and increase operating profit. Compared with the industry, in 2018, the operating profit margin of China Construction Environmental Energy far exceeded the industry by nearly 45 percentage points due to the poor operation of private environmental protection companies, and in 2019, when some companies were still losing money, China Construction Environmental Energy performed well because of its mixed reform, and its performance increased steadily.

On the other hand, the solvency is analyzed, Before the mixed-use reform, the current ratio dropped from 2.92 to 1.29 due to the large amount of capital required for the initial construction and operation of environmental protection projects. After the mixed-ownership reform, state-owned capital was used to support the repayment of short-term debts and broaden the channels for long-term debts, and the current ratio rebounded. The current ratio of the industry has been declining year by year, and it has rebounded slightly in 2019, but there is a large difference between companies [5]. Due to the popularization of the PPP model and the intensification of industry competition, short-term debt has risen, and liquidity pressure has increased. The current ratio of CSCEC Environmental Energy decreased faster than the industry average, and was significantly lower than the industry level in 2018. In the past two years, bank credit has been tight, and the short-term debt financing of China Construction Environmental Energy has increased, and the current ratio is lower than that of the industry, and the short-term debt repayment pressure has increased. In addition, from 2015 to 2019, the asset-liability ratio of CSCEC Environmental Energy was basically lower than the industry average, indicating its strong long-term solvency. The asset-liability ratio rose to 47.82% in 2018 due to the increase in capital demand due to business growth and order increases. After the introduction of state-owned assets, China Construction Environmental Energy integrated resources, reduced expansion, reduced investment, accelerated payment collection, reduced financing needs, and improved debt repayment ability.

4.1.3 EVA analysis

Economic value added refers to the operating income after deducting the entire cost of capital input, including equity and debt, from the after-tax operating profit. Based on the financial data of CSCEC from 2015 to 2021, this paper will calculate the EVA value of CSCEC in each year according to the basic calculation formula of EVA: EVA=NOPAT−TC×WACC, where EVA, NOPAT, TC, and WACC represent economic added value, adjusted net operating profit after tax, adjusted total capital, and weighted average cost of capital, respectively. The economic added value (EVA) of CSCEC from 2015 to 2021 is shown in Table 2.

Table 1: 2015-2021 Financial Indicators of CSCEC Environmental Energy Unit: %

year		2015	2016	2017	2018	2019	2020	2021
Profitability	Return on equity	7.05	5.63	6.44	9.06	9.59	9.51	9.34
	Industry averages	10.23	10.49	10.32	-0.83	4.76	6.08	4.41
	Operating margin	14.32	12.57	14.19	14.11	14.91	14.42	13.60
	Industry averages	11.67	13.51	17.91	-29.59	-9.61	-0.92	11.37
Solvency	liquidity ratio	2.92	2.30	1.59	1.29	1.46	1.44	1.47
	Industry averages	1.78	2.02	1.60	2.03	1.53	1.64	3.32
	Debt-to-asset ratio	24.89	28.59	38.75	47.82	44.54	42.89	43.08
	Industry averages	34.76	40.31	48.67	44.26	44.98	51.68	33.92

Table 2: 2015-2021 economic added value of China Construction Environmental Energy Unit: 100,000 yuan

Index	In 2015	In 2016	In 2017	In 2018	In 2019	In 2020	In 2021
NOPAT	659.27	1430.02	2913.84	3777.16	3831.09	3661.51	3958.35
TC	10672.14	16729.63	19573.67	24155.99	24094.70	26353.11	29221.64
WACC	13.29%	11.23%	15.63%	9.86%	9.95%	5.67%	7.97%
EVA	-759.06	-447.95	-145.95	1394.43	1434.43	2168.24	1630.54

From 2015 to 2020, CSCEC's EVA showed a significant upward trend. Before the "reverse mixed reform", although EVA increased year by year, it remained negative. After the implementation of the "reverse mixed reform" in 2018, the EVA of CSCEC Environmental Energy has increased significantly, turning losses into profits, with an increase of about 10 times. Since then, through 2020, its economic value added has continued to rise steadily, indicating a significant increase in operating capacity, and the return rate has exceeded the cost of capital, creating more value for shareholders. Tracing back to the cause, from 2015 to 2017, the high cost of capital led to a negative EVA. In 2018, the "reverse mixed-ownership reform" optimized financing efficiency and capital structure, strengthened political connections, increased government subsidies and bid-winning projects, and controlled the scale of investment and improved investment efficiency.

4.2 The Impact of Resource Integration on Market Performance after the Reverse Mixed Ownership Reform of China Construction Environmental Energy

4.2.1 The impact path of resource integration on market performance after the reverse mixed ownership reform of China Construction Environmental Energy

Some investors regard the "reverse mixed reform" of private enterprises as a positive signal, believing that its three positive impacts are significant: first, it responds to the national policy guidance and enhances market confidence; the second is to form an alliance with state-owned capital to obtain high-quality resources, expand market share, and increase stock prices; Third, in the asymmetric market, private enterprises can improve the success rate of "reverse mixed reform" and reduce the cost of adverse selection for external investors by accurately considering resources, markets and other factors. However, there are also investors who take the opposite view and believe that the move could have a negative impact. They are worried that the entry of state-owned capital into environmental protection companies may be a passive "takeover", reflecting the poor management of private enterprises, lack of liquidity, and need to rely on state-owned assets to avoid bankruptcy. In addition, the introduction of state-owned assets may lead to the loss of autonomous control and uncertain development prospects, further eroding investor confidence. These concerns have adversely affected the market.

4.2.2 CAR-based short-term capital market impact analysis

Here, according to the event research method, in order to reduce the interference of other factors, the article takes 15 days before and after the announcement as the time window period, recorded as (-15, 15), and takes October 17, 2018, the date of the first announcement of Originwater, as an example, to retrieve the announcement of China Construction Environmental Energy, and there is no event that has an impact on Originwater's stock price during this time window. The estimated window for the article ranges from 130 days to 11 days before the event and is denoted as (-135, -15).

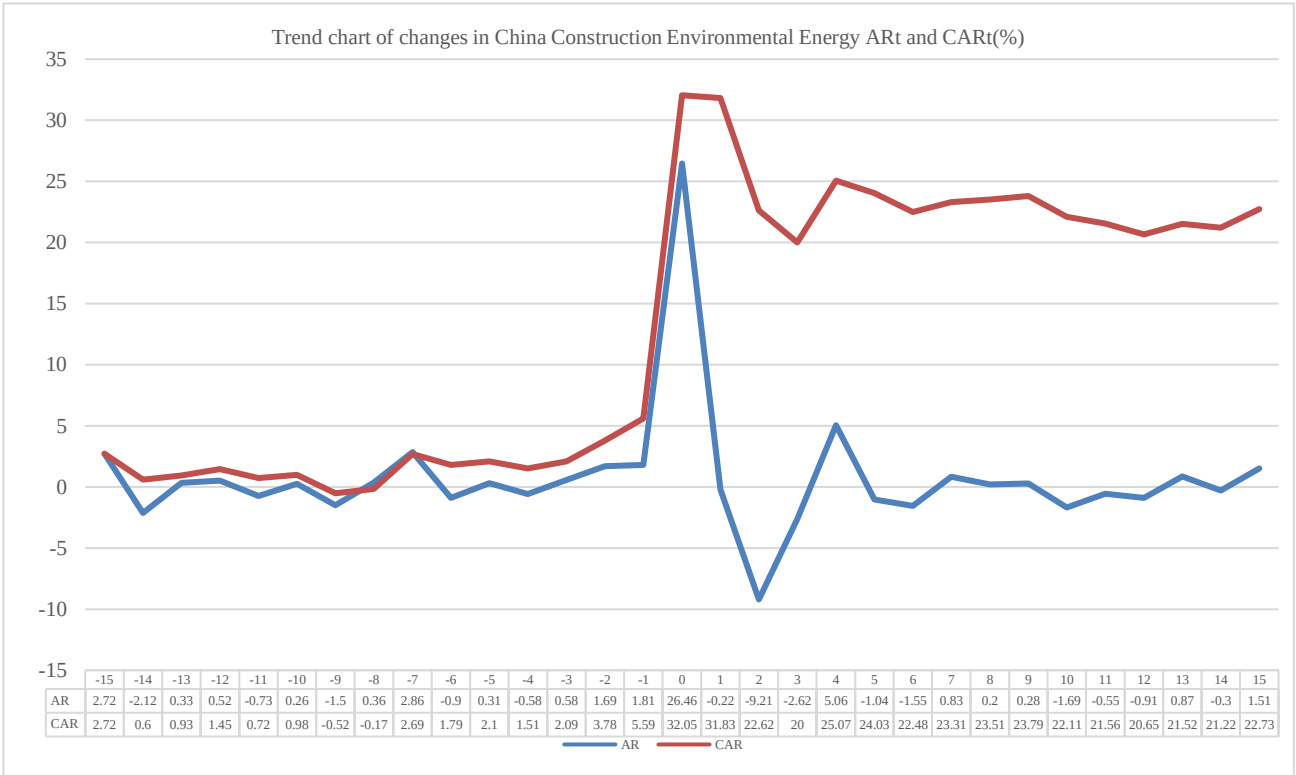
The regression equation is obtained by fitting the relationship between the return rate of individual stocks and the market return of China Construction Environmental Energy by the CAMP model: $E(Rt) = 14095Rmt - 0.0014$

The specific calculation formula for combining AR and CAR:

$$ARt = Rt - E(Rt)$$

$$CAR = \sum ARt$$

The excess rate of return and cumulative excess rate of return within the window period [-15,15] were calculated, and the stock price response was shown in the figure below.



	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AR	2.72	-2.12	0.33	0.52	-0.73	0.26	-1.5	0.36	2.86	-0.9	0.31	-0.58	0.58	1.69	1.81	26.46	-0.22	-9.21	-2.62	5.06	-1.04	-1.55	0.83	0.2	0.28	-1.69	-0.55	-0.91	0.87	-0.3	1.51
CAR	2.72	0.6	0.93	1.45	0.72	0.98	-0.52	-0.17	2.69	1.79	2.1	1.51	2.09	3.78	5.59	32.05	31.83	22.62	20	25.07	24.03	22.48	23.31	23.51	23.79	22.11	21.56	20.65	21.52	21.22	22.73

Figure 1: The trend chart of AR and CAR changes of CSCEC

15 days before the announcement of the "reverse mixed reform" introduced into China Construction Qiming, the cumulative excess rate of return continued to rise. On the day of the event, the share price of China Construction Environmental Energy soared, with a CAR as high as 32.1%, and the market responded enthusiastically to the introduction of state-owned assets. In the following days, the CAR fell slightly to 31.83%, but over time, the CAR stabilized at about 22%, well above the pre-event level. In general, through the introduction of state-owned capital, the market effect is significant in the short term, and the value of the enterprise has been greatly improved.

4.2.3 BHAR-based long-term capital market impact analysis

The CAR value of short-term market reaction does not consider the compound effect, and it is necessary to study the impact of mixed ownership reform on the long-term environmental protection benefits of Energy Conservation and Guozhen in combination with long-term market response. In this paper, the BHAR indicator of the event study method is used to measure the long-term abnormal returns to comprehensively evaluate the effect of the reform.

The window period for long-term event research is usually measured in months, and this paper selects 12 months after the adoption of the mixed ownership reform by CSCEC from October 2018 as the window period, i.e., [1,12]. The buy-and-hold abnormal rate of return BHAR is calculated through the monthly stock return R it and the monthly market return Rpt during the window period, and the specific formula is as follows:

$$\text{Weight} = \prod \text{TT} = 0(1 + \text{RIT}) - \prod \text{TT} = 0(1 + \text{R})$$

Figure 2: The trend chart of the change of BHAR of China Construction Environmental Energy

By analyzing the market performance of China Construction Environmental Energy in the 12 months after the reverse mixed ownership reform. It can be seen that the BHAR value of China Construction Environmental Energy was positive in the first 11 months after the mixed reform, especially in the first 8 months, the BHAR value increased steadily, from 9.20% to 20.88%. However, the BHAR value continued to decline from the 8th to the 12th month, indicating that although the reverse mixed-ownership reform received a positive response from the market in the early stage, the positive impact weakened over time and even turned into a negative impact, indicating that the performance of enterprises did not improve within one year after the mixed-ownership reform.

4.3 The Impact of Resource Integration on Innovation Performance after the Reverse Mixed Ownership Reform of CSCEC

4.3.1 The impact path of resource integration on innovation performance after the reverse mixed reform of Energy Conservation Guozhen

Increasing funding can effectively promote scientific and technological production, thereby improving the quantity and quality of scientific and technological personnel. In an enterprise, technological innovators are the main body of innovation behavior, and their overall quality plays a decisive role in the effect of enterprise innovation activities. With a wealth of knowledge and sharp thinking skills, scientific and technological personnel are able to identify technological innovation opportunities and promote new technologies within the enterprise. In addition, the cooperation between the government and enterprises can learn from each other's strengths and weaknesses, and jointly improve the innovation performance of enterprises by leveraging the technological advantages of both parties.

In this paper, the entropy method is used to determine the weight of the selected index, and the annual evaluation value of enterprise innovation ability is calculated, and the

longitudinal analysis is carried out based on this. Enterprise innovation mainly relies on R&D funds and human resources, which have become the key criteria for measuring innovation investment [6]. The company's innovation output can be assessed by the number of patent applications. In view of the time lag between patent application and grant, it is more appropriate to use the number of patent applications in the current year to evaluate the innovation achievements of enterprises. The core of innovation efficiency is to evaluate the ability of enterprises in research and innovation, specifically, it is used to measure how much scientific and technological output can be transformed into the capital invested by enterprises.

(1) Indicator selection. The selection indicators of the evaluation system of CSCEC's environmental energy innovation ability are shown in the following table.

Table 3: Evaluation index system of CSCEC's environmental energy innovation ability

Level 1 indicators	Secondary indicators	Level 3 indicators	Indicator code
Invest in innovation	Innovation funding	R&D investment	X1
	Innovative manpower	Number of R&D personnel	X2
Innovation Transformation Metrics	Innovation efficiency1	Patent output for every 100,000 R&D investment	X3
	Innovation efficiency2	R&D power	X4
Innovative outputs	Intellectual Property Creation	Number of patent applications	X5
		Number of invention patent applications	X6
	Economic benefit creation	Net profit	X7
		Rate of capital accumulation	X8

(2) Indicator empowerment. After the initial index is selected, the entropy method is used to assign weights to the selected index. First, calculate the entropy value of the ith indicator, and the calculation formula is as follows: Then calculate $e_j = -\frac{1}{\ln n}\Sigma_{i=1}^{n} P_{ij} \ln P_{ij}$ the weight of the ith indicator as follows: The entropy value and results obtained by calculation are shown in the following table: $w_j = \frac{g_i}{\Sigma_{j=1}^{m} g_i}$

Table 4: A table of pre-selected metric entropy and weights result

project	Entropy (e)	Difference coefficient (g)	Weight (w)
X1	0.8414	0.1586	0.0755
X2	0.8209	0.1791	0.0853
X3	0.6672	0.3328	0.1585
X4	0.8136	0.1864	0.0888
X5	0.7035	0.2965	0.1411
X6	0.6261	0.3739	0.1780
X7	0.6622	0.3378	0.1608
X8	0.7648	0.2352	0.1120

(3) Result analysis. According to the comprehensive index model, the overall score of China Construction Environmental Energy before and after the reverse mixed reform was calculated, and the calculation formula was as follows: $PER = \sum_{j=1}^{m} W_j \cdot x_{ij}$

The comprehensive evaluation score (PER) is obtained by accumulating the scores of each stage of CSCEC environmental energy's innovation activities, where wj is the weight of the jth index, and Xij is the standardized result of the jth indicator of the ith year.

Table 5: Comprehensive analysis score scale

year	2016	2017	2018	2019	2020	2021
Innovation investment stage	0	0	0.093	0.0707	0.1217	0.1608
Innovation transformation stage	0.0009	0.0014	0.0267	0.1652	0.2472	0.1631
Integrated output stage	0.1522	0.1811	0.1281	0.208	0.3788	0.3447
Overall score	0.1531	0.2478	0.2478	0.4439	0.7477	0.6686

It can be seen from the table that since the implementation of the mixed ownership reform of state-owned assets, the overall performance of its innovation ability has shown a continuous growth trend.

4.3.2 Innovation input analysis based on entropy method

The innovation activities of enterprises are built on the dual support of capital and talents: the continuous injection of funds ensures the smooth progress of R&D activities, and the active participation of technical personnel constitutes the core of intellectual capital in the innovation process.

Table 6: 2016-2021 innovation investment of CSCEC

year		2016	2017	2018	2019	2020	2021
Innovation funding	R&D investment (10,000	1684.46	2125.84	3624.07	3694.78	3972.64	5142.71
	R&D Intensity (%)	3.45	2.62	2.94	3.12	3.20	3.52
Innovative manpower	Number of R&D personnel	110	135	161	158	173	178
	R&D personnel in the total number (%)	12.4	11.9	10.25	10.3	11.9	12.47
	Master's and Doctor's Degree Personnel (Person)	38	48	53	71	80	89
	Total number of master's and doctoral personnel (%)	4.28	4.23	3.38	4.63	5.5	6.24

CSCEC takes the proportion of R&D expenditure as a key indicator to measure the intensity of R&D investment, demonstrating its firm commitment to R&D and innovation. Since its listing, CSCEC's R&D investment has continued to grow, from 16.8446 million yuan in 2016 to 51.4271 million yuan in 2021. After the mixed-ownership reform in 2018, R&D investment has increased significantly thanks to new ways of raising funds, especially long-term loan opportunities provided by China State Construction Group. At the same time, China Construction Environmental Energy attaches great importance to talent training and introduction, and the number of R&D personnel continues to rise after the mixed reform, ensuring the stability of the technical team. The company also continuously improves the overall quality of the

team by increasing the investment in highly educated talents such as masters and doctors. Despite the shortage of capital liquidity, China Construction Environmental Energy still adheres to technological innovation, and after the mixed reform, it has received economic assistance and technological innovation support from state-owned enterprises, which ensures the stable supply of R&D talents and funds, enables the company to have the strength of independent innovative technology and professional equipment, and promotes the continuous innovation and development of technology.

4.3.3 Innovation output analysis based on entropy method

These infusions allow companies to develop innovative products and technologies at the end of their R&D and to maintain their intellectual property rights by obtaining patents.

Table 7: 2016-2021 innovation output index of CSCEC Environmental Energy

	year	2016	2017	2018	2019	2020	2021
Intellectual Property Creation	Number of patent applications (pieces)	15	11	18	46	89	61
	Number of invention patent applications (pieces)	6	3	6	12	22	21
	Invention patents account for all patent applications (%)	40.00	27.27	33.33	26.09	24.71	34.43

It can be seen from Table 7 that the number of patent applications has continued to rise since its listing, and the growth is particularly significant after the mixed reform, with the number of applications in 2021 being 3.4 times that of 2018, of which the number of invention patent applications has also continued to grow, demonstrating its R&D strength and innovation quality. After the mixed reform, the patent service platform of China Construction Environmental Energy has operated efficiently and strengthened the management and protection of intellectual property rights. Although utility model and design patents account for a large proportion, the proportion of invention patents increases, reflecting the enhancement of the quality of enterprise innovation. Not only did the company not slow down the pace of research and development, but instead increased its efforts, the number of patents increased, and the research results were fruitful. The state capital intervenes to alleviate financing problems, inject funds into technological innovation, and promote the increase of invention patent achievements. Reverse mixed reform has built a platform for enterprises to protect intellectual property rights, research and development of new technologies, and cooperate to solve problems, helping innovation and development. For example, in the Nanhu Ecological Restoration Project in Jiaxing City, CSCEC won the award for its innovative ultra-magnetic separation water purification technology, and developed new products such as sludge dryer and MagBR magnetic bioreactor, demonstrating its continuous innovation and output capabilities.

4.3.4 Innovation efficiency analysis based on entropy method

Patent innovation efficiency has become a key indicator when evaluating the effectiveness of innovation, which reflects the company's ability to transform achievements in R&D investment by calculating the number of patent and invention patent applications that can be generated per million R&D expenditures.

Table 8: 2016-2021 Innovation Efficiency Index of CSCEC Environmental Energy

	year	2016	2017	2018	2019	2020	2021
Research and development	Number of invention patent applications/R&D investment (pieces/million)	0.36	0.14	0.16	0.25	0.55	0.41
	Number of patent applications/R&D investment (pieces/millions)	0.89	0.52	0.49	1.27	2.24	1.19

The efficiency of the invention patent reached its peak in 2016 before the mixed-use reform, and then declined year by year. After the mixed reform, R&D funds have been guaranteed, and highly innovative technology development and invention patent applications have been promoted. From 2018 to the mixed reform, the number of invention patent applications per million R&D investment increased from 0.16 to 0.41, an increase of 156.25%. The efficiency of patent applications has been significantly enhanced, with 2.24 patent achievements per million R&D expenses in 2020, a record high in the past five years, indicating that the efficiency of resource allocation has been greatly improved. The reverse mixed transformation can bring resource effects to China Construction Environment, and government subsidies can fully cover R&D costs, reduce R&D burdens, and improve innovation efficiency. At the same time, the communication channels with government agencies have been optimized, the possibility of tax exemption and exemption has been improved, financial pressure has been reduced, financing costs have been reduced, and innovation efficiency has been further improved.

4.4 The Impact of Resource Integration on Governance Performance after the Reverse Mixed Ownership Reform of China Construction Environmental Energy

4.4.1 The impact path of resource integration on governance performance after the reverse mixed ownership reform of Energy Conservation Guozhen

The reverse mixed-ownership reform affects governance performance by adjusting the shareholding structure, the structure of the board of directors and the board of supervisors. It changes the size of the board of directors, leadership, the proportion of outside directors, adjusts the composition of the supervisory board, and changes the structure and nature of shareholdings, all of which have a combined effect on the corporate governance structure, which in turn has a profound impact on governance performance.

4.4.2 Equity concentration analysis

The general meeting of shareholders is the core

decision-making body of the company, which determines the business strategy of the enterprise. Some enterprises in China have the problem of excessive concentration of shares, which is not conducive to the long-term development of enterprises and the protection of the rights and interests of small and medium-sized shareholders. Hansen (1999) proposes to assess the concentration of shares by the squared sum of the top 10 shareholders' shareholdings, and the lower the value, the more dispersed the shareholding. Table 9 below shows that this indicator of CSCEC Environmental Energy is far below the equilibrium standard of 0.25, and it decreased by 0.07 compared with the previous year after the mixed reform in 2018, and remained stable, indicating that its top ten shareholders have a relatively balanced shareholding, and the mixed ownership reform has further promoted the dispersion of equity, optimized the shareholder structure, and is conducive to corporate governance and the protection of the rights and interests of small and medium-sized shareholders. In addition, before 2018, the equity of China Construction Environmental Energy was highly concentrated, with a dominant share, scattered shareholdings by small and medium-sized shareholders, and a lack of equity checks and balances. After the mixed-ownership reform in 2019, the situation has improved significantly, and the equity checks and balances have been strengthened. Introduce state-owned assets to change controlling shareholders, reorganize the board of directors, improve governance capabilities, and reduce governance risks.

4.4.3 Agency cost analysis

The "reverse mixed reform" of environmental protection enterprises affects financial behavior, and then changes two types of agency costs: the supervision cost of shareholders and managers, and the cost of major shareholders plundering the interests of small and medium-sized shareholders.

Table 9: 2016-2021 equity indicators of China Construction Environmental Energy

year	2016	2017	2018	2019	2020	2021
Concentration of shareholding	0.1899	0.1699	0.1678	0.0944	0.0904	0.0903
Z-index	15.7561	14.5897	15.9781	1.9796	2.1849	2.1849

Table 10: The agency cost of China Construction Environmental Energy from 2015 to 2021

year	2015	2016	2017	2018	2019	2020	2021
Management expense ratio (%)	14.98	14.30	11.94	9.29	10.61	9.98	9.17
Increase in management expense ratio (%)	-	-4.54	-16.50	-22.19	14.21	-5.94	-8.12
Total Asset Turnover	0.32	0.28	0.35	0.40	0.37	0.36	0.40
Change in Total Asset Turnover (%)	-	-12.50	25.00	14.29	-7.50	-2.70	11.11
Other receivables ratio	0.83	1.36	1.42	1.14	0.89	0.59	0.53
Other receivables rate increases	-	63.86	4.41	-19.72	-21.93	-33.71	-10.17

First, the first type of agency cost is analyzed according to the management expense ratio and total asset turnover ratio in Table 10: In 2018, China Construction Huanneng introduced state-owned assets China Construction Qiming to implement the "reverse mixed reform", and the management expense rate decreased by more than two percent, and continued to decline subsequently, showing thatout of its good governance effect. Also, the reverseAfter the mixed reform, the total asset turnover ratio increased to 0.4, and the enterprise was even betterFocus on sound operations, reduce blind expansion, reduce agency costs, and have a positive impact [7]. The second type of agency cost is then analyzed based on the other receivables ratio: Before the "reverse mixed reform", the proportion of other receivables in total assets continued to rise to the peak in 2017, and gradually decreased after the mixed reform, and the agency cost of the second type decreased. This shows that the mixed-ownership reform reduces the willingness of major shareholders to occupy funds, increases free cash flow, helps to alleviate the conflict of interests between major shareholders and small and medium-sized shareholders, and improves governance efficiency [8].

5. Conclusion

This paper deeply studies the resource integration process of China Construction Environmental Energy through the introduction of China Construction Qiming to carry out reverse mixed ownership reform and its far-reaching impact on enterprise performance. The results show that as a private enterprise in the environmental protection industry, in the face of challenges such as financing difficulties and intensified market competition, China Construction Environmental Energy has successfully introduced China Construction Qiming, which has strong financial strength and abundant resources, as a strategic investor, through reverse mixed reform. This move not only significantly broadened the financing channels of CSCEC and enhanced its financial strength, but also enhanced the market competitiveness and brand influence of the enterprise through resource integration. In the process of mixed reform, China Construction Environmental Energy has clarified the key path of resource identification, acquisition and integration, and successfully integrated the high-quality resources brought by China Construction Qiming through a series of measures such as equity transfer, change of controlling shareholder, reorganization of the board of directors and introduction of management. The integration of these resources not only optimizes the financial structure of CSCEC Environmental Energy, reduces financing costs, but also promotes the company's technological innovation and market expansion, and significantly improves the company's financial performance, market performance and innovation performance. In addition, the reverse mixed ownership reform has also brought about the optimization of the corporate governance structure, and improved the company's decision-making efficiency and governance capabilities. With the help of the credibility and strength of state-owned enterprises, China Construction Environmental Energy has further enhanced the confidence of market investors and enhanced the market value of enterprises.

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