

Performance Analysis of Green-oriented M&A in Thermal Power Enterprises: A Case Study of Huaneng Power International

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Abstract

Under the "dual carbon" goal, green and low-carbon transformation of thermal power enterprises has become a general trend, and green-oriented M&A is an important way for enterprises to quickly acquire clean energy assets. This paper is based on the green-oriented M&A event of a certain enterprise in 2020. It selects data from 2018 to 2025, constructs a performance evaluation system from the dimensions of financial performance and environmental performance, and conducts a horizontal comparative analysis with the same industry. The research shows that green-oriented M&A can quickly increase the proportion of clean energy installed capacity, optimize the power source structure, and thus improve the environmental performance by directly acquiring existing grid - connected clean energy assets. Constrained by factors such as the scale of M&A and the cyclical fluctuations of coal prices, the short - term financial synergy effect is weak. In the long run, the incorporated clean energy assets can continuously optimize the enterprise's business structure and alleviate the profit fluctuations of the thermal power business to a certain extent. The research conclusions can provide practical references for thermal power enterprises to implement green-oriented M&A and promote low - carbon transformation.

Keywords

Thermal Power Enterprises; Green-oriented M&A; Performance Analysis.

1. Introduction

In September 2020, China unveiled the dual-carbon strategic objective. Low-carbon green transition has hence emerged as a key agenda for high-carbon enterprises. The thermal-power sector underpins China's power supply while generating substantial national carbon emissions. Figures from the *2025 Annual Development Report of China's Electric Power Industry*, compiled by the China Electricity Council, indicate that standard coal consumption for power supply hit 302.4 g/kWh for domestic thermal-power units rated at 6000 kW and above by the end of 2024. This figure represented a year-on-year increase of 0.51 g/kWh. The carbon emission intensity for thermal-power generators keeps rising. Green transition has therefore become an urgent priority for the sector.

In recent years, the Chinese government has introduced policies such as the Guiding Opinions on Promoting the Development of the Energy Electronics Industry and the Opinions on Improving the Institutional Mechanisms and Policy Measures for Green and Low-Carbon Energy Transition, encouraging energy enterprises to achieve green and low-carbon transition through mergers and acquisitions. This has made green-oriented M&A an important pathway for thermal power firms to pursue low-carbon transition.

Pan Ailing, Liu Xin and colleagues (2019)[1] argue that green-oriented M&A refers to the incorporation of green concepts into corporate M&A decision-making, with sustainable development as the ultimate goal. Wu Yewei, Zhou Linyu and others (2023)[2] define green-oriented M&A as M&A activities initiated by heavily polluting enterprises targeting

environmentally friendly and energy-efficient firms. Such activities serve as a key response to the national ecological civilization strategy and green transition. Yang Zihan and Lyu Chan (2024)[3] find that green-oriented M&A emphasizes ecological benefits, takes into account the environmental friendliness of target firms, and integrates green concepts throughout the M&A lifecycle.

Regarding the relationship between green-oriented M&A and performance, Pan Ailing and Wu Qian (2020)[4] suggest that the government should improve the environmental performance assessment mechanism and, for heavily polluting enterprises with slow transition progress, employ a mix of market-based and administrative policy tools to encourage the integration of green elements into their business development practices. He Fan and Meng Fanchen (2022)[5] propose that enhancing the firm's own innovation performance should be the primary consideration in designing green-oriented M&A schemes. Yang Rong and Chen Xiaolin (2023)[6], using M&A data of heavily polluting enterprises from 2015 to 2019, find that green-oriented M&A has no effect on the number of green invention patents but can increase corporate excess returns. Wang Wenhua and Shen Jiamin (2022)[7], based on a sample of heavily polluting A-share listed companies in Shanghai and Shenzhen from 2012 to 2020, empirically demonstrate that such M&A can improve environmental performance, with green technological innovation capability serving as a partial mediator. Wang Bo and Tan Xia (2021)[8] note that green-oriented M&A can generate economic benefits for polluting enterprises and promote their development. Wang Wei, Tian Zhuoyue and colleagues (2022)[9] show that M&A can improve environmental governance efficiency by reducing agency costs and curbing major-shareholder tunneling, thereby enhancing environmental performance. Wang Lei, Chen Jing and others (2025)[10] point out that state-owned enterprises, after engaging in green-oriented M&A, should promote resource integration and technology transfer and application to ensure the integration of green technologies into production and operational systems, thereby achieving environmental performance improvement.

As one of the largest listed thermal power enterprises in China, a certain enterprise has a leading installed capacity, and its green transformation is typical and representative in the thermal power industry. This paper takes this enterprise as the research object, uses the single - case study method, and analyzes the impact of green-oriented M&A on performance through entropy value evaluation and horizontal comparison with the same industry for its green-oriented M&A event in 2020. Through the analysis of the leading thermal power enterprise, this paper enriches the microscopic empirical evidence of the performance of green-oriented M&A in the thermal power industry and provides practical references for similar enterprises to promote low - carbon transformation through M&A.

2. Theoretical Foundations

2.1. Sustainable Development Theory

The sustainable development theory refers to a development model that meets the development needs of contemporary society without harming the ability of future generations to meet their own needs. For thermal power enterprises, green transformation is a requirement for sustainable development, and green-oriented M&A is an important path for enterprises to quickly acquire clean energy assets. Through green-oriented M&A, the energy structure can be optimized, the environmental performance can be improved, and the enterprise's sustainable development can be promoted.

2.2. Resource-Based Theory

The resource - based view regards enterprises as a collection of various heterogeneous resources, emphasizing the value, scarcity, difficulty in imitation, and non - substitutability of

resources. When an enterprise cannot quickly obtain specific resources through self - construction, M&A can quickly acquire external resources. According to the resource - based theory, heavily polluting enterprises can quickly obtain the green technology and resources of the target enterprise through green-oriented M&A. Self - development is restricted by indicators, site selection, and construction cycle, and the speed is slow. A certain enterprise can directly acquire assets such as wind power and photovoltaic through green-oriented M&A.

2.3. Synergy Theory

The synergy theory means that when two or more factors work together, the result is greater than the sum of the effects of each factor working alone. The synergy effect of green-oriented M&A can be reflected in the improvement of environmental performance. By merging green assets such as wind power and photovoltaic, the proportion of clean energy installed capacity can be immediately increased, the power source structure can be optimized, the energy efficiency and pollution control level of thermal power can be improved, and the overall environmental performance of the enterprise can be promoted.

3. Case Overview and Green-oriented M&A Activities

3.1. Overview of Huaneng Power International

Huaneng Power International, Inc. (HPI), established in 1994, is one of the largest listed power generation companies in China. Its core business encompasses the investment, construction, and operation of power plants. In recent years, HPI has pursued a green and low-carbon transition. Since 2016, it has regularly published an Environmental, Social, and Governance (ESG) Report. As a representative firm in the thermal power industry's green transition, HPI has a clear transition roadmap. In addition to organic project development, green-oriented M&A represents one key channel for the company to rapidly expand its clean-energy installed capacity. In 2020, HPI completed green-oriented M&A deals targeting wind power and photovoltaic assets. These deals expanded its clean-energy portfolio through market-based acquisitions. By the end of 2025, the company's total controllable installed capacity reached 155,869 MW, of which low-carbon and clean-energy installed capacity accounted for 63,917 MW, rising from 16.5% in 2018 to 41.01% in 2025-an increase of 24.51 percentage points over seven years.

3.2. Green-oriented M&A Activities of Huaneng Power International

Green-oriented M&A constitutes one pathway for heavily polluting enterprises to achieve low-carbon transition. Following Pan et al., such M&A is defined as strategic acquisitions of green resources-including clean energy and energy-saving and emission-reduction technologies-to facilitate corporate green transformation and sustainable development. In this study, transactions are identified as green-oriented M&A if they meet two criteria: (1) the acquisition of equity or assets grants control over the target, with its financial results consolidated into HPI's statements; and (2) the target's primary business involves clean energy generation, such as photovoltaic or wind power. HPI's major green-oriented M&A transactions are presented in Table 1.

Table 1. Major Green-oriented M&A Transactions of Huaneng Power International

Year	Target	Primary Business
2020	Huaneng Shandong Taifeng New Energy Co., Ltd.	Photovoltaic power generation
2020	Tianjin Longye New Energy Development Co., Ltd.	Photovoltaic power generation
2020	Shandong Huaneng Laizhou Wind Power Co., Ltd.	Wind power generation

All three transactions were completed in 2020, with total consideration of approximately RMB 236 million—a modest amount relative to HPI's multi-billion-yuan asset base. The 2020 green-oriented M&A thus did not serve as the primary driver of the firm's green transition. Instead, HPI has relied predominantly on organic development, including self-financed wind-power and photovoltaic projects and joint ventures, to advance its low-carbon transformation. The 2020 M&A deals were primarily intended to supplement clean-energy capacity in specific regions rather than to achieve a large-scale restructuring of the overall power mix.

4. Analysis of the Impact of Green-oriented M&A on Performance

4.1. Construction of the Performance Evaluation Index System

This study applies entropy-value evaluation to assess the comprehensive performance of Huaneng Power International over the period 2018–2025. Given the nature of green-oriented M&A and the industry characteristics of thermal power enterprises—high energy consumption, high emissions, and pronounced cyclicity—the evaluation index system is constructed along two dimensions: financial performance and environmental performance.

For financial performance, eight indicators are selected following established frameworks in domestic M&A performance research. These indicators capture changes in operating quality, financial stability, and long-term development potential before and after the green-oriented M&A implementation.

For environmental performance, four indicators are chosen with reference to the GRI Sustainability Reporting Standards, the Cleaner Production Evaluation Index System for the Power Industry (Coal-fired Power Enterprises), and HPI's ESG disclosures. These indicators measure the environmental impact of green-oriented M&A from two angles: power mix optimization and end-of-pipe pollutant abatement. The specific indicators are presented in Table 2.

Table 2. Performance Evaluation Index System

Dimension	Indicator Category	Indicator Name	Unit	Direction
Financial Performance	Profitability	Weighted Return on Equity (ROE) (%)	%	Positive
Financial Performance	Profitability	Net Profit Margin (%)	%	Positive
Financial Performance	Solvency	Asset-Liability Ratio (%)	%	Negative
Financial Performance	Solvency	Current Ratio	—	Positive
Financial Performance	Operating Capacity	Total Asset Turnover (times)	times	Positive
Financial Performance	Operating Capacity	Accounts Receivable Turnover (times)	times	Positive
Financial Performance	Growth Capacity	Year-on-Year Growth in Operating Revenue (%)	%	Positive
Financial Performance	Growth Capacity	Year-on-Year Growth in Net Profit Attributable to Shareholders (%)	%	Positive
Environmental Performance	Green Transition	Low-Carbon and Clean Energy Installed Capacity Ratio (%)	%	Positive
Environmental Performance	Pollutant Emissions	SO ₂ Emissions (g/kWh)	g/kWh	Negative
Environmental Performance	Pollutant Emissions	NO _x Emissions (g/kWh)	g/kWh	Negative
Environmental Performance	Pollutant Emissions	Dust Emissions (g/kWh)	g/kWh	Negative

Table 3. Raw Performance Indicator Data for Huaneng Power International, 2018–2025

Indicator	Unit	2018	2019	2020	2021	2022	2023	2024	2025
Weighted ROE (%)	%	1.88	1.20	3.81	−18.71	−18.50	11.25	13.14	19.04
Net Profit Margin (%)	%	1.42	1.28	3.37	−6.05	−4.09	3.57	5.75	8.51
Asset-Liability Ratio (%)	%	74.77	71.72	67.71	74.68	74.82	68.33	65.40	65.26
Current Ratio	—	0.447	0.431	0.429	0.496	0.506	0.553	0.539	0.523
Total Asset Turnover (times)	times	0.432	0.424	0.397	0.442	0.497	0.487	0.435	0.383
Accounts Receivable Turnover (times)	times	7.267	6.919	6.258	5.989	6.190	5.938	5.254	4.883
Year-on-Year Growth in Operating Revenue (%)	%	11.04	2.19	−2.39	21.03	20.31	3.11	−3.48	−6.62
Year-on-Year Growth in Net Profit Attributable to Shareholders (%)	%	−17.42	8.83	191.51	−319.19	26.17	214.33	20.01	42.17
Low-Carbon and Clean Energy Installed Capacity Ratio (%)	%	16.50	16.92	20.60	22.39	26.07	31.24	35.82	41.01
SO ₂ Emissions (g/kWh)	g/kWh	0.08	0.07	0.07	0.07	0.06	0.07	0.06	0.06
NO _x Emissions (g/kWh)	g/kWh	0.16	0.14	0.13	0.13	0.13	0.14	0.13	0.13
Dust Emissions (g/kWh)	g/kWh	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01

(1) Data Standardization

Since the indicators are measured in different units, the min-max normalization method is applied to standardize the raw data. The formulas for positive and negative indicators are specified as follows:

For positive indicators: $X'_{ij} = \frac{X_{ij} - \min(X_j)}{\max(X_j) - \min(X_j)}$

For negative indicators: $X'_{ij} = \frac{\max(X_j) - X_{ij}}{\max(X_j) - \min(X_j)}$

Where X_{ij} denotes the raw value of the j -th indicator in year i , $\max(X_j)$ and $\min(X_j)$ represent the maximum and minimum values of the j -th indicator over the period 2018–2025, and X'_{ij} is the standardized value ranging from 0 to 1. The standardization results for each indicator are presented in Table 4.

Table 4. Standardized Values of Performance Indicators for Huaneng Power International

Indicator	2018	2019	2020	2021	2022	2023	2024	2025
Weighted ROE	0.5454	0.5274	0.5966	0.0000	0.0056	0.7936	0.8437	1.0000
Net Profit Margin	0.5130	0.5034	0.6470	0.0000	0.1346	0.6607	0.8104	1.0000
Asset-Liability Ratio (negative)	0.0052	0.3243	0.7437	0.0146	0.0000	0.6789	0.9854	1.0000
Current Ratio	0.1452	0.0161	0.0000	0.5403	0.6210	1.0000	0.8871	0.7581
Total Asset Turnover	0.4298	0.3596	0.1228	0.5175	1.0000	0.9123	0.4561	0.0000
Accounts Receivable Turnover	1.0000	0.8540	0.5768	0.4639	0.5482	0.4425	0.1556	0.0000
Year-on-Year Growth in Operating Revenue	0.6387	0.3186	0.1530	1.0000	0.9740	0.3519	0.1136	0.0000
Year-on-Year Growth in Net Profit Attributable to Shareholders	0.5656	0.6148	0.9572	0.0000	0.6473	1.0000	0.6358	0.6773
Low-Carbon and Clean Energy Installed Capacity Ratio	0.0000	0.0171	0.1673	0.2403	0.3905	0.6014	0.7882	1.0000
SO ₂ Emissions	0.0000	0.5000	0.5000	0.5000	1.0000	0.5000	1.0000	1.0000
NO _x Emissions	0.0000	0.6667	1.0000	1.0000	1.0000	0.6667	1.0000	1.0000
Indicator	2018	2019	2020	2021	2022	2023	2024	2025

(2) Determination of Weights Using the Entropy Weight Method

After standardization, the entropy-value evaluation method is applied to determine the weights of each indicator. This approach is objective in nature: the smaller the information entropy of an indicator, the greater its variation and the more information it conveys. Consequently, such an indicator should be assigned a higher weight in the comprehensive evaluation. Conversely, a larger information entropy corresponds to a lower weight.

Assuming there are n evaluation years and m evaluation indicators, the raw data matrix is denoted as $X = (x_{ij})_{n \times m}$, and after standardization, the matrix is $Y = (x'_{ij})_{n \times m}$. The procedure for calculating information entropy is as follows:

1) Calculate the proportion of the indicator value for year i under indicator j :

$$p_{ij} = \frac{x'_{ij}}{\sum_{i=1}^n x'_{ij}}$$

To avoid the undefined condition of $\ln(p_{ij})$ when $p_{ij} = 0$, a small positive constant is added to the standardized values.

2) Calculate the information entropy e_j for indicator j :

$$e_j = -k \sum_{i=1}^n p_{ij} \ln(p_{ij})$$

Where, $k = 1/\ln(n)$, $0 \leq e_j \leq 1$.

3) Calculate the coefficient of difference d_j for indicator j :

$$d_j = 1 - e_j$$

4) Calculate the weight w_j for indicator j :

$$w_j = \frac{d_j}{\sum_{j=1}^m d_j}$$

The calculated entropy values, coefficients of difference, and weights for each indicator are presented in Table 5.

Table 5. Entropy Values, Coefficients of Difference, and Weights

Indicator	Entropy e_j	Coefficient of Difference d_j	Weight w_j (%)
Weighted ROE (%)	0.8650	0.1350	8.64
Net Profit Margin (%)	0.8770	0.1230	7.87
Asset-Liability Ratio (%)	0.8330	0.1670	10.69
Current Ratio	0.8440	0.1560	9.99
Total Asset Turnover (times)	0.8580	0.1420	9.09
Accounts Receivable Turnover (times)	0.8830	0.1170	7.49
Year-on-Year Growth in Operating Revenue (%)	0.8240	0.1760	11.27
Year-on-Year Growth in Net Profit Attributable to Shareholders (%)	0.9200	0.0800	5.12
Low-Carbon and Clean Energy Installed Capacity Ratio (%)	0.8070	0.1930	12.36
SO ₂ Emissions (g/kWh)	0.8960	0.1040	6.66
NO _x Emissions (g/kWh)	0.9120	0.0880	5.63
Dust Emissions (g/kWh)	0.9190	0.0810	5.19

(3) Calculation of Comprehensive Performance Scores

Once indicator weights are finalized, the linear weighted-sum approach is applied to compute the annual comprehensive performance scores of Huaneng Power International:

$$S_i = \sum_{j=1}^m w_j \times x'_{ij}$$

Where S_i denotes the comprehensive score for year i , w_j represents the weight of the j -th indicator, and x'_{ij} is the standardized value of the j -th indicator in year i . The financial performance score and environmental performance score are computed independently, and the annual comprehensive performance score is obtained as the sum of these two sub-scores.

Table 6. Comprehensive Performance Scores of Huaneng Power International, 2018–2025

Year	Financial Performance Score	Environmental Performance Score	Comprehensive Score
2018	0.3176	0.0000	0.3176
2019	0.2856	0.1248	0.4104
2020	0.3025	0.1622	0.4647
2021	0.2500	0.1712	0.4212
2022	0.3480	0.2231	0.5711
2023	0.5000	0.1970	0.6970
2024	0.4292	0.2722	0.7014
2025	0.3824	0.2984	0.6808

4.2. Analysis of Evaluation Results

(1) Financial Performance Analysis

Financial-performance components take up 70.16 % of the index weight for Huaneng Power International. Year-on-year revenue growth, debt-to-asset ratio and current ratio show the highest levels of dispersion among these sub-indicators. Shifts in corporate profitability and capital structure serve as major sources of financial-performance swings across the sample period.

Before the green-oriented M&A deal, Huaneng's financial-performance score fell from 0.3176 in 2018 to 0.2856 in 2019. Domestic coal prices moved upward over this stretch, pushing up operating costs for thermal-power segments and squeezing corporate profits. The firm's financial metrics weakened accordingly. Huaneng completed the transaction in 2020, and its financial-performance score edged up slightly to 0.3025. Still, the deal remained modest in scale. Newly added clean-energy capacity stayed limited, and related earnings could not make up for shrinking thermal-power profits amid higher coal prices. Real gains for financial performance therefore stayed marginal. Financial-performance readings dropped again to 0.25 in 2021. Sharp coal-price surges triggered widespread profit declines across the whole thermal-power sector. Assets obtained in the 2020 acquisition could not shield the firm from mounting cost-driven operating pressures. Conditions improved between 2022 and 2024. Coal prices retreated, core thermal-power businesses regained profitability, and the company worked to improve its debt profile, lifting overall financial-performance outcomes step by step.

External industry forces such as coal-price movements largely dictated changes in financial performance. The green-oriented M&A itself failed to reverse short-term downward trends in financial results. Even so, newly-added wind-power and photovoltaic assets generate cash flows independent of coal-price volatility. They reshape the firm's profit composition and lower business reliance on thermal-power operations. A cleaner generation mix can soften cyclical risks tied to coal-price swings over time and strengthen the firm's financial stability. The M&A delivers structural business-adjustment value in this sense, yet tangible financial benefits do not materialize immediately.

(2) Environmental Performance Analysis

Within the evaluation system built for Huaneng Power International, environmental-performance components account for 29.84 % of total index weight. Among individual sub-indicators, the share of low-carbon clean-energy installed capacity registers the largest contribution at 12.36 %. Dispersion remains low across the three pollutant-emission metrics. Such observations suggest that end-of-pipe pollution control has reached a stable state, thanks to widespread ultra-low-emission retrofits and existing regulatory oversight. There is little scope left to cut pollutant emissions further.

Prior to the M&A, throughout 2018-2019, the firm conducted no green-oriented M&A transactions. Instead, it deployed new-energy projects via organic transition pathways including self-financed construction and capital-increased joint ventures, and its environmental-performance score rose accordingly. In 2020, the year of the M&A completion, the environmental-performance score climbed from 0.1248 to 0.1622. All acquired targets were grid-connected, operational wind and photovoltaic assets. Unlike greenfield projects, they entailed no permitting, construction or commissioning lead times. Consolidated into the firm's clean-energy installed capacity immediately upon transaction closing, these assets rapidly expanded clean-energy capacity and optimized the power-mix, delivering an immediate improvement in environmental performance.

In the post-M&A period starting in 2021, the firm pursued no further M&A deals. Even so, environmental performance kept improving, as the growth driver shifted from acquired assets to newly commissioned self-developed new-energy projects. This phased shift further

demonstrates that the M&A acts as an efficient short-term structural-optimization tool to boost environmental performance rapidly, while self-built projects deliver sustained long-term improvement.

Since the firm's end-of-pipe pollutant emissions have largely reached the upper limits of ultra-low-emission standards, further gains in environmental performance can hardly be driven by end-of-pipe abatement alone. Decarbonization of the power-mix thus becomes the sustainable improvement pathway. By enabling swift access to mature, operational clean-energy assets, the M&A serves as a vital instrument for accelerating power-mix optimization.

(3) Comprehensive Performance Analysis

From 2018 to 2025, Huaneng International's overall performance score increased from 0.3176 to 0.6808, showing an upward trend. Prior to the M&A in 2018–2019, the company relied on self-development and joint ventures to expand into new energy, resulting in only gradual improvements in comprehensive performance. The composite score climbed from 0.4104 in 2019 to 0.4647 in 2020, reflecting mild progress after the completion of Huaneng's green-oriented M&A in that year. Although the transaction scale of this green-oriented M&A was relatively small and had limited impact on overall financial performance, it effectively expanded the capacity of clean energy installations, optimized the scale of green assets, and boosted environmental performance, thereby marginally enhancing the company's overall performance. In 2021, the composite score declined slightly to 0.4212, primarily due to a sharp rise in coal prices, which negatively impacted profitability across the thermal power sector. However, the clean energy assets acquired through the 2020 green-oriented M&A helped mitigate the downward pressure on overall performance to some extent, demonstrating the structural role of green-oriented M&A in smoothing cyclical fluctuations and stabilizing long-term performance. From 2022 to 2024, the composite score continued to rise steadily, increasing from 0.5711 to 0.7014. This improvement was driven by enhanced financial performance following the decline in coal prices, combined with the synergistic effects of earlier green-oriented M&A activities and large-scale self-developed renewable energy projects coming online, all contributing to ongoing optimization of the power generation mix. In 2025, the composite score saw a slight dip, mainly due to temporary rebound in local coal prices and concentrated cost amortization during the initial operation phase of newly added renewable energy projects, leading to a minor decline in financial performance and consequently a slight drop in the overall score.

Huaneng International's green-oriented M&A has proven effective in improving environmental performance, though its impact on short-term financial performance is limited. While it cannot fundamentally alter the company's short-term financial performance, which remains subject to industry cycles, it helps accelerate the expansion of green assets and optimize the power structure, thereby mitigating operational impacts caused by coal price volatility.

4.3. Peer Comparison

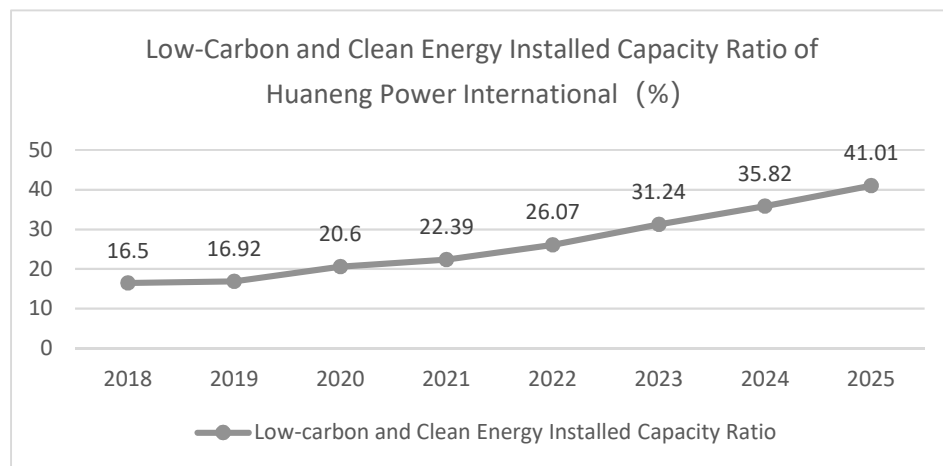
To further examine how green-oriented M&A shapes environmental performance, this paper carries out peer-group benchmarking against GD Power Development and Datang Power Generation. Huaneng Power International, GD Power Development and Datang Power Generation all fall under China's five major power conglomerates as publicly traded power-generation entities. Their total installed capacity, asset base and operating revenue operate at broadly similar scales, making them reasonable candidates for comparison. For the study period spanning 2018 to 2025, GD Power closed a green-oriented M&A deal back in 2022, when it took over photovoltaic projects owned by Zhengtai New Energy. Datang Power, meanwhile, recorded no substantial green-oriented M&A activity throughout these years.

Table 7. Overview of Green-oriented M&A Events for Peer Firms, 2018–2025

Company	Green-oriented M&A Events	Year	Target Type
Huaneng Power International	Shandong Taifeng New Energy PV, Tianjin Longye New Energy PV, Laizhou Wind Power	2020	PV, Wind
Guodian Power	Acquisition of Zhengtai New Energy PV Project	2022	PV
Datang Power	No major green-oriented M&A	—	—

Table 8. Low-Carbon and Clean Energy Installed Capacity Ratio for Peer Firms, 2018–2025

Company	2018	2019	2020	2021	2022	2023	2024	2025
Huaneng Power International	16.50%	16.92%	20.60%	22.39%	26.07%	31.24%	35.82%	41.01%
Datang Power	19.88%	20.36%	22.59%	23.55%	24.51%	28.70%	31.99%	31.99%
Guodian Power	36.87%	23.09%	23.77%	22.45%	26.23%	31.05%	33.19%	35.11%

**Figure 1.** Low-Carbon and Clean Energy Installed Capacity Ratio of Huaneng Power International, 2018–2025

From 2018 to 2025, the clean-energy installed capacity shares of Huaneng Power International, Datang Power Generation, and GD Power Development all trended upward. Among the three firms, Huaneng held the lowest share back in 2018, sitting at only 16.50%.

Huaneng completed no green-oriented M&A throughout 2018–2019. Its clean-energy capacity expansion depended mostly on self-developed projects. Across these two years, the share grew by an average of merely 0.21 percentage points annually, reflecting slow expansion. When Huaneng wrapped up its green-oriented M&A transactions in 2020, its share rose sharply from 16.92% to 20.60%. Growth cooled in 2021 in the absence of further such deals, with a 1.79-percentage-point rise compared with the 3.68-point gain recorded for 2020. No new green-oriented M&A activity took place between 2023 and 2025. Improvements in capacity share in this phase stemmed chiefly from large-scale wind-power and solar-power projects. These projects had been planned years earlier and came online in concentrated batches. By the end of 2025, Huaneng's clean-energy installed capacity share hit 41.01%. The firm posted a total increase of 24.51 percentage points across eight years, outperforming its two peers in terms of growth magnitude. Huaneng consistently invested in building its own new-energy assets. Project development lead times, however, kept early-stage capacity increases fairly limited. When the company pursues green-oriented M&A, it gains access to already-operational photovoltaic facilities. These assets get included in capacity statistics right after deal completion. As a consequence, the firm records higher clean-energy volumes for that fiscal year.

Zero-carbon generation accounts for a larger fraction of the power mix, overall energy consumption and emission levels drop, and environmental-performance metrics see tangible improvements..

Datang Power relies primarily on self-development and joint ventures for its green transformation, resulting in a steady but moderate growth rate in clean energy capacity share, which remained stable at 31.99% from 2024 to 2025. Guodian Electric Power underwent a major restructuring of its thermal power assets in 2019, causing a sharp decline in clean energy capacity share. After acquiring ZTE New Energy's photovoltaic projects in 2022, the share rose from 22.45% to 26.23%. Similarly, during the period of green-oriented M&A, a temporary improvement in the clean energy structure was observed.

Companies relying solely on independent project development face constraints from project approval processes and construction timelines, leading to smoother and more gradual increases in clean energy capacity, making short-term leapfrog growth difficult. Green-oriented M&A, by contrast, enables rapid expansion of clean energy capacity in the short term, facilitating phased improvements in clean energy ratios, accelerating optimization of the power generation mix, and enhancing environmental performance.

5. Conclusion and Implications

Focusing on Huaneng Power International's 2020 green-oriented M&A, this study uses performance data from 2018 to 2025 to construct an evaluation framework covering both financial and environmental dimensions. It also selects Guodian Power and Datang Power for peer comparison to examine the impact of such M&A on the performance of listed thermal power enterprises. The main conclusions are as follows.

In the short term, the transaction led to a modest improvement in financial performance in the year of completion, though the financial synergy effect remained weak, as the newly added new energy revenue was insufficient to offset the earnings pressure from coal-price-induced thermal power cost increases. Over the longer term, however, the wind and photovoltaic assets acquired through the transaction, being free from fuel-cost pressures, contribute to sustained business-structure optimization and strengthen the firm's resilience against earnings risks in the thermal power segment arising from cyclical coal-price fluctuations.

Green-oriented M&A, by acquiring already grid-connected wind and photovoltaic assets, can immediately increase the share of clean energy installed capacity-in contrast to the three-to-five-year construction cycle typical of greenfield new energy projects-and thus deliver immediate positive effects on environmental performance. It therefore constitutes an effective pathway for thermal power enterprises to optimize the power mix over shorter time horizons. As a viable green transition approach, green-oriented M&A allows thermal-power enterprises to rapidly access existing clean-energy asset stocks. Firms can coordinate a mix of transition strategies such as acquisitions, independent construction, capital increases and joint ventures. These measures help continuously optimize power and business structures and lift overall corporate performance. For the thermal-power sector as a whole, further improvements are needed to the trading mechanism for existing clean-energy assets. A well-functioning market can deliver diversified transition channels and support thermal-power enterprises in advancing low-carbon transformation.

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