

Opportunities and Challenges in the Transition to Clean energy of Heilongjiang Energy Sales Company: Basis for Strategic Plan

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Abstract. The study at China Huaneng Group Heilongjiang Energy Sales Company explored the transition to clean energy, focusing on the opportunities and challenges involved. It aimed to understand how the company is adapting to this shift by analyzing current operations and evaluating the feasibility of adopting cleaner energy sources. Surveys were distributed to purposively sampled employees, and data was analyzed using descriptive statistics and mean scores. The study provided a detailed characterization of the company, including its business form, years of operation, scope, and asset size as of 2023. It assessed key operational aspects such as technology, production capacity, facilities, and the cost-benefit of transitioning to clean energy. Strategic recommendations were proposed to enhance the company's readiness for this transition, outlining specific objectives and strategies for implementation. The findings highlighted the importance of maintaining efficiency in both current operations and the shift to cleaner energy sources. The study offered valuable insights and strategic guidance to help China Huaneng Group Heilongjiang Energy Sales Company successfully navigate the transition to a more sustainable energy model while aligning with its financial goals.

Keywords: Energy company; Challenges, Clean energy; Opportunities; Transition

1. Introduction

China Huaneng Group Heilongjiang Energy Sales Company, established in 2016 and headquartered in Harbin, Heilongjiang province, plays a crucial role in the region's power and heat generation and sales. As the company transitions toward becoming a clean energy entity, it must navigate the complex challenges associated with China's ongoing power sector reforms. These reforms, initiated in 2015, have introduced market-based mechanisms such as mid- to long-term electricity forward markets and expanded ancillary services, with the latest 2022 reforms aiming to establish a national electricity

market by 2025. The volatility in coal prices and the rising importance of renewable energy sources underscore the urgency of these reforms, which seek to enhance the integration of renewables and improve the overall efficiency and security of the power system (Guo, 2020).

The study conducted at China Huaneng Group Heilongjiang Energy Sales Company focused on identifying the challenges and opportunities presented by the company's shift to clean energy. It highlighted the importance of market reforms in enhancing system flexibility, particularly in the context of high renewable energy penetration. The study emphasized the need for improved ancillary services and spot market mechanisms to stimulate various flexible resources, such as gas, electricity, and energy storage, to meet the growing demand for flexibility in China's power system (Lam, 2005).

2. Methodology

The study explored the challenges and opportunities in Heilongjiang Energy Sales Company's transition to clean energy, using a quantitative descriptive design to provide comprehensive insights into the company's operations and transition strategies. According to McCombes (2019) and Amante (2010), the descriptive research methodology effectively captures and interprets the relevant data, making it suitable for developing a strategic plan that addresses the complexities of moving towards sustainable energy practices.

2.1. *Sampling Procedure*

The study employed purposive sampling to collect data based on the knowledge and experience of the key respondents. The researcher chose members of the population to include in the study using a non-probability sampling approach, as explained by Crossman (2018). This approach may allow the researcher to select individuals who meet specific criteria to achieve the research objectives.

2.2. *Respondents*

The respondents for the study are the senior executives and employees of China Huaneng Group Heilongjiang Energy Sales Company, headquartered in Harbin, Heilongjiang province, China.

Table 1 Distribution of Respondents

Respondents	Sample	Percentage
Senior executives	5	4.54
Regular Employees	105	95.46
Total	110	100%

Table 1 shows the distribution of the respondents.

2.2.1 Research Site

The study was conducted at Heilongjiang Province, China, situated in Northeast China, boasting a population of 32 million and a power supply area spanning about 4.7×10^5 km². The overall installed generation capacity in Heilongjiang Province is redundant, with coal power units primarily dedicated to heat supply, exhibiting low utilization efficiency and facing severe surplus.

3. Results and Discussion

3.1 Profile of China Huaneng Group Heilongjiang Energy Sales Company

Table 2 Company Profile

Items	Profile
Form of Business	State- Owned Energy Company
Years in Operations	Since 2016
Scope of Operations	National
Number of Employees	111 regular employees and 340 labor workers
Existing Markets	Business Establishments, Institutions, Factories and Industrial parks
Sales Revenue as of 2023	18.2 million yuan

Table 1 shows the The China Huaeng Group Heilongjiang Energy Sales Company is a state-owned energy company, it is more than 7 years of existence as energy supplier to the province of Harbin, Heilongjiang, the company currently provides services not only in the province of Harbin, Heilongjiang but nationally, it has a total of 111 regular employees and

more than 340 labor workers, the existing markets are business establishments, institutions, factories and industrial parks and lastly the sales revenue in 2023 is amounting to 18.2 million yuan.

3.2 Operations of Energy Company

The following were the results of the study on the operations of energy company.

Table 3 Overall Result on the Operations of Energy Companies

Indicator/s	Overall Weighted Mean	Verbal Description
Technology	3.09	Agree
Production Capacity	3.27	Strongly Agree
Facilities	3.29	Strongly Agree
Maintenance	3.25	Agree
Cost and Benefits Analysis	3.25	Agree
Grand Mean	3.23	Agree

Legend: Strongly Agree– 3.26 to 4.00; Agree– 2.52 to 3.25; Disagree– 1.76 to 2.50; Strongly Disagree– 1.00 to 1.75

Table 2 shows the overall result on the operations of energy companies. The grand mean on the results was 3.23 which was verbally described as “Agree”.

3.2.1 Operations of Energy Companies in Terms of Technology

The study indicates the significant yet balanced role of technology in the operations of China Huaneng Group Heilongjiang Energy Sales Company, with a weighted mean of 3.09, indicating a moderate impact. Technology’s influence is crucial, especially in enhancing decision-making processes and optimizing production and distribution within the company (Codete, 2023). The findings underscore the necessity of prioritizing technological integration to thrive in today's dynamic business environment (Codete, 2023).

3.2.2 Operations of Energy Companies in Terms of Production Capacity

The The study reveals that production capacity plays a critical role in the operations of China Huaneng Group Heilongjiang Energy Sales Company, with a weighted mean of 3.27 indicating a strong influence on operational effectiveness. This highlights the importance of closely monitoring production capacity, especially regarding the additional overhead costs associated with new

equipment (Global Data, 2021). As noted by Global Data (2021), energy companies in China invest heavily in various power sources to meet the growing energy demands, making the efficient utilization of production capacity essential for sustaining market supply.

3.2.3 Operations of Energy Companies in Terms of Facilities

The data indicates that facilities are critical to the operations of China Huaneng Group Heilongjiang Energy Sales Company, with an average weighted mean of 3.29, categorized as “Strongly Agree.” This emphasizes that maintaining and managing physical assets, planning infrastructure to support productivity, and ensuring operational efficiencies are key priorities for the company. According to Michel (2020), facilities represent significant assets and costs for any business, impacting productivity and requiring strategic planning to minimize costs and maximize value. This highlights the importance of facilities in creating a productive and safe work environment, essential for both employee satisfaction and operational success.

3.2.4 Operations of Energy Companies in Terms of Maintenance

The result shows that maintenance is significant in the operations of China Huaneng Group Heilongjiang Energy Sales Company, with a weighted mean of 3.25, indicating general agreement on its importance. Maintenance activities are essential for preventing system failures, optimizing production, and ensuring continuous energy supply (Muscad, 2023). Furthermore, proactive maintenance practices contribute to a safer working environment, which in turn enhances productivity and customer trust (Muscad, 2023).

3.2.5 Operations of Energy Companies in Terms of Cost and Benefit Analysis

The data shows that cost and benefit analysis is a critical concern in the operations of China Huaneng Group Heilongjiang Energy Sales Company, with an average weighted mean of 3.25, categorized as "Agree." This emphasizes the importance of evaluating both tangible and intangible costs and benefits before making significant decisions, such as building a new plant or undertaking a new project. Stobierski (2019) asserts that cost-benefit analysis involves comparing the projected costs and benefits of a decision to determine its feasibility, which is crucial for effective organizational decision-making.

3.3 Transition to Clean Energy

The following are the results on the challenges and opportunities in terms of the transition to clean energy.

3.3.1 Challenges on the Transition to Clean Energy

Table 4 Challenges on the Transition to Clean Energy

No	Indicator	Weighted Mean	Verbal Description
1	Shortage of technical staff	3.50	Strongly Agree
2	Fragmented IT environment	3.15	Agree
3	Consumer Demands and Energy Transparency	3.40	Strongly Agree
4	Political and Economic Disruptions	3.60	Strongly Agree
5	Variability of Renewable Energy Sources	3.30	Strongly Agree
6	Digital Transformation and Smart Metering	3.0	Agree
7	Changing Customer Expectations	3.30	Strongly Agree
Average Weighted Mean		3.32	Strongly Agree

***Legend: Strongly Agree– 3.26 to 4.00; Agree– 2.52 to 3.25; Disagree– 1.76 to 2.50; Strongly Disagree– 1.00 to 1.75

Table 4 shows the results of the challenges on the transition to clean energy. The transition to clean energy for China Huaneng Group Heilongjiang Energy Sales Company faces significant challenges, with an overall weighted mean of 3.32 indicating that these issues are critically important. Key challenges include political and economic disruptions (mean of 3.60), a shortage of technical staff (mean of 3.50), and the variability of renewable energy sources (mean of 3.30), all of which require extensive planning and adaptation (Paidant, 2023; Kolskowka, 2023). These factors impact the company’s sustainability efforts and necessitate substantial changes in technology, staff, and infrastructure (Meraqui, 2023).

3.3.2 Opportunities on the Transition to Clean Energy

Table 5 shows the results of the opportunities on the transition to clean energy.

Table 5 Opportunities on the Transition to Clean Energy

No	Indicator	Weighted Mean	Verbal Description
1	Development of New Business Models	3.50	Strongly Agree
2	Renewable Energy Investment Focus	3.80	Strongly Agree
3	Commitment to Digital Transformation	3.60	Strongly Agree
4	Technological Infrastructure Updates	3.40	Strongly Agree
5	Greenhouse Gas Reduction	3.30	Strongly Agree
6	Commitments	3.70	Strongly Agree
7	Training for new systems and processes Consumer-center approach	3.30	Strongly Agree
Average Weighted Mean		3.51	Strongly Agree

****Legend: Strongly Agree- 3.26 to 4.00; Agree- 2.52 to 3.25; Disagree- 1.76 to 2.50; Strongly Disagree- 1.00 to 1.75*

The transition to clean energy for China Huaneng Group Heilongjiang Energy Sales Company offers substantial opportunities, with an average weighted mean of 3.51 indicating strong potential benefits. Key opportunities include focusing on renewable energy investment (mean of 3.80), training for new systems (mean of 3.70), and commitment to digital transformation (mean of 3.60). However, these opportunities necessitate significant preparations, such as upgrading technology infrastructure and adapting business models to align with evolving consumer needs and regulatory requirements (Wright, 2023).

3.4 Proposed Strategic Plan for Energy Company

The findings reveal several challenges on the transition energy. The proponent proposed a strategic plan based on the result of the study.

3. Conclusions

Huaneng Energy Company, a state-owned enterprise since 2016, operates nationally with 111 regular employees and 340 labor workers, serving various industrial sectors and reporting a sales revenue of 18.2 million yuan in 2023. The

company's operations, including technology, production capacity, facilities, and maintenance, necessitate extensive planning and substantial financial investment for upgrades and transitions. While transitioning to clean energy presents numerous challenges, it also creates opportunities to improve services and better meet market demands. A strategic plan is crucial to address these challenges, such as technical staff shortages, fragmented IT systems, consumer demands, and evolving customer expectations.

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