

Original Article

Energy Consumption Costs and Financial Performance of Quoted Cement Manufacturing Companies in Nigeria

¹Joy Odekhe Eshioramhe, ²J.A. Adejuwon

^{1,2} Department of Management & Accounting, Faculty of Management and Social Sciences, Lead City University, Ibadan, Oyo State, Nigeria.

Received Date: 20 October 2025

Revised Date: 11 November 2025

Accepted Date: 13 November 2025

Published Date: 16 November 2025

Abstract: This study investigates the relationship between energy consumption costs and the financial performance of publicly listed cement manufacturing companies in Nigeria. Energy costs constitute a significant portion of operational expenditures in the cement industry due to its energy-intensive nature, primarily involving electricity and fossil fuels in clinker production, grinding, and packaging processes. The study draws on audited financial statements of quoted cement companies in Nigeria for the period of nine years (2015–2023). The descriptive statistics indicate that Energy Efficiency Ratio (EER) has a mean of 0.24 and the highest variability ($SD = 0.32$, Skewness = 2.22), suggesting differences in energy usage effectiveness across firms. Electricity Energy Cost (EEC) shows a lower mean (0.16) and minimal dispersion ($SD = 0.09$), indicating relatively stable electricity costs across firms. Specific Fuel Energy (SFE) has a mean of 0.20, high kurtosis (5.61), and positive skewness (2.26), meaning some firms incur significantly higher fuel-specific energy than the rest. The three financial performance indicators: Sales Revenue (SR), Gross Profit (GP), and Profit After Tax (PAT) show statistically significant relationships with energy consumption cost, as their p -values are below the 0.05 threshold (Sales Revenue (SR) and Gross Profit (GP): 0.00; Profit After Tax (PAT): 0.01. High t -statistics (Sales Revenue (SR): 16.75, Gross Profit (GP): 13.27, Profit After Tax (PAT): 4.87 indicate strong evidence against the null hypothesis, suggesting that energy consumption cost significantly influences each aspect of financial performance. Positive coefficients (6.93 for SR, 3.81 for GP, 1.25 for PAT). The research provides practical insights for stakeholders, including policymakers, investors, and industry managers, in designing cost-effective energy policies that support sustainable industrial growth and financial resilience in the cement manufacturing sector.

Keywords: Financial Performance, Energy Cost, Cost Management, Cement Manufacturing.

I. INTRODUCTION

The role of cement and the construction industry in economic development in Nigeria cannot be overemphasized. The cement production process represents the largest energy consumption sector in developing countries and has a high dependence on thermal and electrical energy. In Nigeria, electricity supply is generally erratic, and energy costs are high; manufacturers are adopting strategies to manage their energy use.

Energy consumption cost (electricity, diesel, coal, gas and alternative fuels) is one in which a part of the structure shows us the involvement of cement firms in energy buying. These costs have a direct effect on the financial efficiency of organizations regarding their profitability or return on investment, as well as competition in domestic and international markets.

Cement production in Nigeria is energy-intensive and uses thermal and electric energy. The production requires more energy to run the kilns and mills for clinker and grinding than what is used in other equipment. Because of the high energy consumption in the cement production, energy becomes an important operational factor that has a direct impact on the efficiency, cost and environmental impact of the cement industry.

In Nigeria, energy consumption problems related to cement production are just one of the contributing factors; issues of unstable power supply and high cost of energy occur, and they add to the difficulties. Variability in power supply from the national grid led to many cement producers using alternative energy like diesel, gas and captive power plants. Although these options may help to ensure a more secure energy supply, they are also associated with increased utility costs and higher levels of carbon dioxide emissions.

Cement production is highly energy-consuming, with about 60–70% of the demand for thermal and electric power used in different steps during its production, ranging from preparation of raw material to clinker and final grinding (Madlool, Saidur, Hossain) high dependency setc makes Nigerian cement manufacturers vulnerable to variations in global energy prices, forex fluctuation and supply chain breakdown (Akinyele & Rayudu, 2016). These external forces make energy efficiency a cost management strategy and risk mitigation practice to keep operations up and running. Companies that lack the implementation



of energy efficiency best practices would normally manage increasing operating costs, reducing margins and perhaps losing their competitive advantage in the industry (Obamuyi & Olayemi, 2019).

In the cement industry, energy management can be guided not only by cost but also by environmental and regulatory concerns. The cement production is responsible for considerable greenhouse gas emissions, mainly CO₂, which is largely due to the combustion of carbon-containing materials and the calcination during clinker forming (International Energy Agency [IEA], 2018). The challenges posed by climate change and the imperative to reduce carbon emissions are putting increasing pressure on the Nigerian cement industry in its bid to mitigate GHG emissions, not coverage, since Nigeria is a signatory to the Paris Agreement (Okafor & Joe-Uzuegbu, 2010). Thus, an increasing number of companies seek alternative fuels that reduce the energy consumption and environmental impact, such as waste-derived fuels, biomass and natural gas (Ali et al., 2011).

Thereafter, the efficient energy utilization has become a major challenge for the strategic management of cement companies in Nigeria (Adegbite & Olorunfemi, 2017). For cement companies, energy costs are one of their most important cost elements (including prices of electricity, diesel, coal, gas and other alternative fuels) and often constitute a significant portion (up to 40%) of the total production cost (U.S. Energy Information Administration, 2020). These costs have significant implications for the financial performance of enterprises, including profitability margins, return on investment and general attractiveness in the local and international markets (Worrell et al., 2017). The capability to control energy costs can be pivotal for cement producers, not only in preserving their profitability, but also in helping them to support the nation's economic growth and development (OECD, 2019).

The knowledge of energy consumption and its dynamics, as well as the influence on financial performance in the cement industry in Nigeria, is essential for all stakeholders, policymakers and investors (IEA, 2020). The relationship between energy consumption and the profitability of a firm is analyzed, the goal being to offer useful information about how Nigeria's cement industry can be considered according to strategic directions for increasing energy efficiency, enabling cost reduction and improving its factual position in the global market (Gielen & Taylor, 2009).

This study seeks to establish a link between energy costs and financial performance as represented by (SR), GP, and profit after tax, gauging some aspects for stakeholders and policy makers. Prominent scholars such as Nwaiwu and Oluka (2018), p:145 have written about the influence of environmental cost disclosure on financial performance and Abbas et al. (2013) stressed the drivers of financial performance in firms.

Statement of the problem

Although energy costs are very significant, there is a paucity of empirical studies on the link between energy cost and financial performance in quoted cement companies in Nigeria (Oyewole & Oyewole, 2019). More importantly, the quoted cement manufacturing firms in Nigeria, which are Dangote Cement, BUA Cement and Lafarge Cement, have recorded fluctuating financial reports over the years. Their financial statements between 2015 and 2023 show massive variation in their sales revenue, gross profit and profit after tax.

For instance, Sales Revenue, Gross Profit, and Profit After Tax (PAT) for Nigeria's Top Cement Companies in 2022 and 2023:

- **Dangote Cement:** Sales Revenue in 2023: N2.208 trillion, representing a 36.4% year-over-year growth from N1.618 trillion in 2022. Gross Profit: Not explicitly stated, but the cost of sales was N662.9 billion in 2022, with a gross profit of N955.4 billion; assuming a similar ratio, the gross profit for 2023 could be estimated. Profit After Tax (PAT): N455.58 billion in 2023, up from N382.31 billion in 2022.
- **BUA Cement:** Sales Revenue in 2023: N459.999 billion, 8% year-over-year growth. Gross Profit: Not explicitly stated, but in 2022, the company had a revenue of N360.9 billion and cost of sales of N197.9 billion, resulting in a gross profit of N163 billion; applying a similar calculation for 2023, the gross profit could be estimated. Profit After Tax (PAT): N69.45 billion, down from N101.01 billion in 2022.
- **Lafarge Cement:** Sales Revenue in 2023: N405.502 billion. Gross Profit: In 2022, revenue was N373.2 billion with a cost of sales of N177 billion, resulting in a gross profit of N196.2 billion; a similar calculation could be applied for 2023. Profit After Tax (PAT): N51.14 billion, down from N53.65 billion in 2022.
- The total revenue of the top cement companies in 2023 was N3.074 trillion, an impressive 31% yoy rise. Notwithstanding the above, both BUA cement and Lafarge cement firms saw changes in profitability saddled by high costs and foreign exchange losses.

The study is prompted by the importance of which affordable cement prices have an impact within Nigeria on low-income housing and, in general, the economy and hence a desire to know what energy costs are required for these demands based on quoted companies involved in the manufacturing process. In particular, the research will investigate energy usage cost

elements that affect the financial viability of cement production and determine, with respect to end-user prices, what level of cost-saving will be worthwhile and propose recommendations for improvement.

II. OBJECTIVE

Aim of the study: This study sets out to examine the costs of energy consumption as they affect the financial performance quoted cement manufacturing companies in Nigeria.

A) Hypotheses

Ho: Energy consumption cost has no significant positive effect on financial performance of quoted cement manufacturing companies in Nigeria.

B) Significance of the study

The results of this study are expected to be useful for policy decisions so as to draw up policies that will assist in minimising the costs of energy used and enhance the financial performance of quoted cement manufacturing firms in Nigeria. The research will help industrial firms to avoid wasting energy and lower energy consumption costs, thereby leading to higher financial performance. It will also be relevant to potential investors desiring to invest in quoted manufacturing companies' shares in Nigeria by offering them an insight into the possible effect of energy consumption costs on profitability.

III. LITERATURE REVIEW

A) Conceptual Review

a. Financial Performance

Financial performance is the indicator of how well a firm uses its assets from its primary mode of business to generate revenues. In quoted cement companies in Nigeria, particularly in view of the statistics on quoted cement companies in Nigeria, financial performance is significant as an indicator of operating performance, cost control and profitability. It is a measure of the degree to which these companies make their input costs, most significantly energy usage, into sustainable economic value.

Cement production is an energy-intensive process, and the low cost of electricity in the Indian cement industry is a concern. C1 These costs affect important financial ratios such as gross profit margin, return on assets (ROA), return on equity (ROE) and net profit margin. As Olayiwola and Osabuohien (2021) observed, higher energy prices have impacted the profit margins of cement firms in Nigeria, particularly their bottom lines.

To recap, the financial performance of Nigerian cement manufacturers is substantially a function of the cost of energy consumption. Cost-effective energy control is imperative to keep competitive profitability and shareholder value in this volatile economy.

b. Energy Consumption Cost

The cost of energy consumption was found to be a function of Energy Efficiency Ratio, Electrical Energy Consumption and Specific Fuel Energy and represents the total amount that is paid by firms who actually pay for all types of energy used in their production processes. As regards quoted cement firms in Nigeria, energy cost is a significant proportion of operational expenses since cement production is very energy intensive with the crushing, grinding, heating (in kiln) and bagging of raw materials. It needs large amounts of electrical power and thermal energy (typically fueled with coal, gas or oil) to be heated in the kiln at extreme temperatures, so the energy is also one of the essential inputs for cement production.

Production of cement normally requires constant and high energy power through the elification phase, which is performed at very high temperatures (around 1,450°C). Energy cost contributes about 30–40% of the total production costs in Nigerian cement companies and, as a result, is a key driver of profitability and financial performance (Okonkwo & Ekezie, 2020). "Especially in Nigeria, where energy infrastructure problems can force companies to run off of self-generated power, which is much more expensive than public supply."

B) Theoretical Review

a. The Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory presents a coherent theoretical underpinning for consideration of energy consumption cost and its impact on financial performance in quoted cement manufacturing companies in Nigeria. First laid down by Wernerfelt (1984) and further extended to Barney's work in 1991, the RBV theory argues that firms can generate competitive advantage if they manage their internal resources and capabilities well, especially those that are both valuable, rare, inimitable and non-substitutable (VRIN). Energy assets such as the availability of cheap electric utilities, an effective energy management system and renewable forms of energy in the context of the Nigerian cement industry may be

considered as strategic resources from an RBV perspective. And firms that have built a more efficient energy consumption cost model are turning these operational efficiencies into better financial results. High energy prices can severely impact profitability, but companies that invest in energy-saving technologies and materials, such as energy-efficient products, switch to cost-effective fuels like natural gas, or make use of waste heat recovery methods, may be able to realize a competitive cost advantage.

b. The Contingency (TC) Theory

Another useful perspective for studying the relationship between energy consumption cost and the financial performance of cement manufacturing firms could be through the Contingency Theory. Developed initially by Burns and Stalker (1961) and extended by Lawrence and Lorsch (1967), the theory posits that there is 'no one best way to manage a firm', but rather, successful management of a firm depends upon how well managers align organizational strategy & structures with external environmental conditions. The Nigerian cement sector functions within a very fluid environment, as there is poor power supply, depreciating fuel prices and unstable government policies on energy.

Drawing on the Contingency Theory, this chapter contends that the financial survival of cement companies will be contingent upon the degree to which they adjust their cost management strategies in response to such environmental uncertainties. For instance, firms that are addressing inconsistent electricity availability by investing in captive power plants (standard or renewable), and integrating alternative energy sources can reduce the impact of increasing energy costs and ensure profitability. On the other hand, companies that do not respond to these external contingencies tend to experience increased operational risk and eroding financial performance. Therefore, the theory suggests that organisational performance in the Nigerian cement industry depends on flexible and dynamic strategies to ensure there is alignment between internal energy management practices and external realities in the energy market.

C) Empirical Review

Empirical evidence from studies that have investigated the impact of energy consumption costs on financial performance reveals that such costs significantly affect the ability of cement manufacturing firms in Nigeria to be profitable and sustainable. A study by Akinbuli and Olowolaju (2019) examined the impact of energy costs on revenue creation for selected manufacturing organisations in Nigeria with emphasis on cement manufacturers. The findings showed that there is a significant negative relationship between energy expenditure and net profit margin, indicating that higher investment in energy leads to deteriorated financial performance. The research highlighted that energy-efficient firms generate and report better financial performance owing to their reduced operating expenses.

In a similar vein, Ezeaku and others (2020) investigated the influence of energy input costs on ROA in listed cement companies in Nigeria during a 10-year period. Their study, also conducted using panel regression analysis, indicated that energy costs were significant contributors to a negative impact on ROA, and thus, it can be inferred here that energy represents an essential cost center which influences the efficiency of asset utilization negatively. The authors suggested that investment in energy-saving technology and local sourcing of energy should be prioritized to offset this impact. Their finding supports previous findings by Olayiwola and Osabuohien (2018), who revealed that energy supply shocks and rising dependence on alternative energy sources like diesel had significantly led to the financial distress of quoted companies in the Nigerian Stock Exchange.

Similarly, Adegbite and Olorunfemi (2017) carried out firm-level cost structure analysis of the industrial sector in Nigeria, which showed that energy constituted over 35% of total production costs in cement firms. This high production cost became a major limitation on profits, particularly for companies that did not have access to subsidized energy and a consistent power supply. Their research backed the assertion that energy cost, infrastructure and efficient impact on the economic viability of Manufacturing Firms in Nigeria.

Also, Akinyemi and Olatunji (2019) analyzed the nexus of energy consumption and firms' financial performance in Nigeria's cement sector with panel data spanning from 2008 to 2017. They found that changes in the costs of energy significantly reduce profit margins, and those companies that are more dependent on diesel and gas suffered higher volatility of operating costs. According to the report, investments in energy efficiency and power mix diversification are becoming essential strategies to ensure the competitiveness of the sector.

Similarly, Nwosu and Adewale (2019) investigated the influence of an increase in cost of production on return on assets (ROA) and return on equity (ROE) of cement firms quoted on the Nigerian Stock Exchange. Their calculations indicated that the largest coefficient is attributed to energy costs of all the operating cost variables, indicating that measures of maximizing profits should be directed towards energy cost management.

Similarly, there is evidence by Ibrahim and Musa (2021) on a relation between energy infrastructure and financial performance in Nigeria's cement industry through firm-level panel regression. They noted that companies with access to natural gas pipelines and a consistent electricity supply were up to 22% more profitable than those using imported coal or diesel. The research emphasized the relevance of investment in infrastructure and energy diversification to improve firm performance.

In another article, Okonkwo and Ahmed (2018) performed cost comparisons of various West African Cement Plants. Nigerian businesses had the highest costs for energy matters in the region, mainly because of poor electricity supply and dependence on diesel generators. They concluded that these excessive costs impacted negatively on profit margins, making Nigerian cement companies less competitive than their counterparts in Ghana and Senegal.

D) Conceptual Model

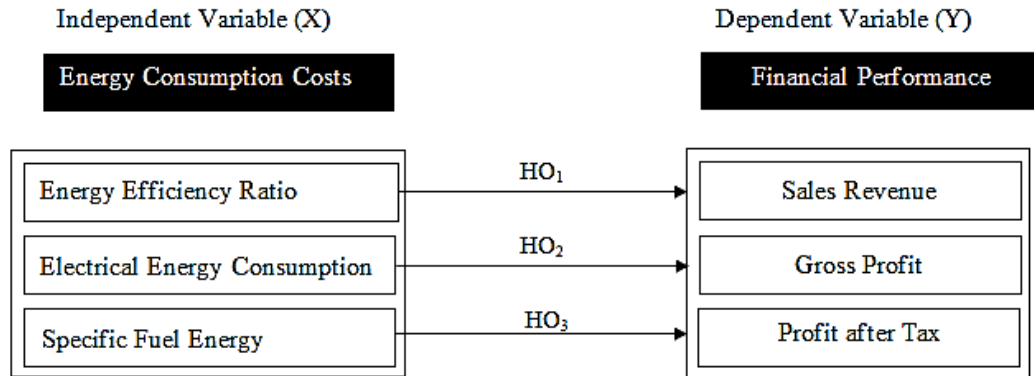


Figure 1. Research Model Linking Energy Consumption Costs to Financial Performance

Source: Researcher's Conceptual Model, 2025

E) Summary of the Gap in Literature

Though there have been many studies on environmental accounting and financial performance, the relationship between energy consumption costs and the financial performances of quoted cement manufacturing companies in Nigeria has not been given due attention (Adewuyi & Olowookere, 2018). With energy cost as a major determinant, many studies examine environmental accounting disclosures by the preparers and only in relation to firms' characteristics and financial performance, without considering that they are being incurred as costs down the corporate line (Olusegun & Ogundele, 2019).

There is a dearth of literature on the influence of energy consumption on financial performance in the Nigerian Manufacturing sector" (Adewuyi and Olowookere, 2018). Also, it is said that, as well in the case of Olusegun and Ogundele (2019), "energy costs consumption is a significant influence on financial performance in manufacturing companies in Nigeria".

IV. METHODOLOGY

Using an ex-post facto research design and purposive sampling technique, the paper investigated the connection between energy consumption costs and the financial performance of quoted cement firms in Nigeria.

The design of the study was ex post facto in approach and makes use of secondary data on 9 years (2015-2023) audited reports/data of quoted cement manufacturing companies in Nigeria with an up-to-date financial report to provide a systematic and objective way for investigating whether high costs incurred from energy consumption will adversely influence firms' financial performance among cement manufacturing companies in Nigeria.

The financial performance indicators are calculated using financial statements and ratios. The model can be represented as follows:

$$FP_t = \beta_0 + \beta_1 ECC_t + \varepsilon_t$$

Where:

FP_t = Financial Performance (measured by sales revenue, gross profit, and profit after tax)

ECC_t = Energy Consumption Costs

ε_t = Error term

- β coefficients represent the strength and direction of the relationships between energy consumption costs and financial performance.

A) Results and Discussion of Findings**a. Presentation of Data****Table 1: Descriptive Statistics of Energy Consumption Costs and Financial Performance**

	SR	GP	PAT	EER	EEC	SFE
Mean	1.13	0.64	0.42	0.24	0.16	0.20
Standard Error	0.20	0.10	0.04	0.11	0.03	0.08
Median	0.97	0.57	0.45	0.09	0.13	0.13
Standard Deviation	0.59	0.31	0.13	0.32	0.09	0.23
Sample Variance	0.34	0.09	0.02	0.10	0.01	0.05
Kurtosis	(0.84)	(1.29)	(1.23)	5.29	0.48	5.61
Skewness	0.71	0.41	(0.29)	2.22	1.16	2.26
Range	1.61	0.83	0.36	1.00	0.28	0.74
Minimum	0.52	0.27	0.24	0.04	0.07	0.04
Maximum	2.13	1.10	0.61	1.03	0.35	0.78
Sum	10.29	5.85	3.86	2.24	1.52	1.98
Count	9.00	9.00	9.00	9.00	9.00	9.00
Confidence Level (95.0%)	0.45	0.24	0.10	0.25	0.07	0.18

*Source: Field Survey, 2025***Table 2: Correlation Analysis of Energy Consumption Costs and Financial Performance**

	SR	GP	PAT	EER	EEC	SFE
SR	1.00					
GP	0.96	1.00				
OP	0.90	0.94				
PAT	0.80	0.81	1.00			
EER	(0.02)	(0.06)	(0.21)	1.00		
EEC	0.90	0.91	0.82	(0.00)	1.00	
SFE	0.01	(0.01)	(0.30)	(0.25)	0.02	1.00

Source: Field Survey, 2025

Table 1: It was clear that, unlike financial performance indicators such as sales revenue, gross profit and profit after tax, which remained fairly consistent across quoted Cement companies, energy consumption costs components, particularly energy efficiency ratio (EER) and specific fuel expense (SFE), were quite divergent from one another, with a positive skewness present. Energy Efficiency Ratio (EER) with an average of 0.24 and the maximum variability between firms (SD=0.32, Skewness = 2.22), highlighting heterogeneities in energy usage effectiveness among firms. The mean of Electricity Energy Cost (EEC) is lower (0.16) and is dispersed less (SD = 0.09), which would lead to similar levels of electricity cost across the firms. The mean of SFE is 0.20 with a high kurtosis (5.61) and positive skewness (2.26), indicating that some firms pay more specific fuel energy compared to others on average.

Table 2: In terms of the impact of energy consumption costs on financial performance, mixed outcomes are found: On the one hand, electricity costs are positively correlated to good financial results that can be explained by larger production scales. EEC: Associated positively with 0.90, GP: 0.91, PAT: 0.82. EER Weak/Neg -0.02GP: -0.06PAT: -0.21 SFE, weak/negative 0 (i.e., specification) GP-0.01 PAT: -0.30. Interestingly, higher fuel costs and low energy efficiency both have negative correlations with financial performance, suggesting that they could harm profitability.

Table 3: Summary of Findings

S/N	Hypothesis	Financial Performance Metric	Coefficient	Standard Error	T- Statistics	P-Value
H01:	Energy consumption cost -> financial performance	Sr (Sales Revenue)	6.93	0.41	16.75	0
		Gp (Gross Profit)	3.81	0.29	13.27	0
		Pat (Profit After Tax)	1.25	0.26	4.87	0.01

Source: Field Survey, 2025

The three financial ratios, Sales Revenue (SR), Gross Profit (GP), and PAT, provide statistically significant relationships with energy consumption cost since they had their p-value less than the threshold level of 0.05% (SR and GP: 0.00; PAT: 0.01). High t-statistics (SR: 16.75, GP: 13.27, and PAT: 4.87) mean there is strong evidence against the null hypothesis and energy consumption cost has a significant influence on every dimension of financial performance. The positive coefficients (6.93 in the case of SR, 3.81 in the case of GP, and 1.25 in the case of PAT) indicate that an increase in energy prices has a tendency to lead to better financial performance, perhaps reflective of higher energy use being positively correlated with more production and sales capabilities.

V. CONCLUSION

This research has established a statistical base for the correlation of energy cost and the financial performance of quoted cement manufacturing firms in Nigeria. The results provide a lucid understanding of how energy cost indicators, especially electricity costs, specific fuel use and energy efficiency are all adjusted for in sales revenue, gross profit and after-tax profits measures. In other words, fluctuations in electricity tariffs and fuel prices stimulate changes in operational cost levels, leading to a reduction in profitability. Meanwhile, companies that have embraced energy-saving technologies or diversified energy sources have become better at achieving stable production costs and sustaining a price competition mechanism.

In addition to profitability, the study also shows that energy cost dynamics impact two broader aspects of financial performance and investment opportunity. For example, companies with persistently high energy costs had lower returns on assets and less ability to reinvest profits to expand or modernize facilities. In contrast, companies' greater access to stable and relatively cheaper energy sources was revealed as having enhanced financial resilience and market value. This pattern demonstrates the strategic function of energy management in determining short-term performance as well as long-term growth paths for cement companies.

In general, the evidence adds to our understanding of the cost-performance relationship in Nigeria's cement sector by highlighting concerns about energy pricing, efficiency and infrastructure as inherent to financial health rather than being solely operational issues. The study highlights the significance for cement producers to invest more in sustainable energy and policy measures that may relieve the pressure of energy costs as well as improve industrial efficiency..

A) Recommendations

The following suggestions are offered for better management of energy costs to increase financial performance:

- i. Cement industries are encouraged to source energy-efficient technologies, as well as alternative sources of energy (e.g., waste heat recovery, solar or biomass), so as to minimize their reliance on expensive fossil fuels and maximize the EERs.
- ii. Energy audits need to be made institutional in cement plants so that energy usage can be tracked, waste points identified, and optimum levels of consumption defined as standard limits.
- iii. The government also must embrace what policies are needed to incentivize energy efficiency, analogous to subsidies or tax breaks given to companies that purchase green energy technologies, so industry adopts.
- iv. Industry regulators and environmental authorities need to work together toward sustainable energy use, while ensuring that energy efficiency standards are met without impairing industrial productivity.

VI. REFERENCES

- [1] Adeyemi, A. M., & Salami, A. O. (2019). Energy cost and firm performance in Nigeria's manufacturing sector: Evidence from firm-level data. *Nigerian Journal of Economic and Social Studies*, 61(3), 45–62.
- [2] Adebayo, M. M., Ogunleye, A. B., & Yusuf, T. O. (2020). Energy cost and financial performance of manufacturing firms in Nigeria. *Journal of Economics and Sustainable Development*, 11(12), 85–94.
- [3] Adegbite, S. A., & Olorunfemi, S. (2017). Cost structure and financial performance of industrial firms in Nigeria: The energy cost perspective. *Journal of Economics and Sustainable Development*, 8(5), 122–130.
- [4] Akinbuli, S. F., & Olowolaju, P. S. (2019). Energy cost and profitability performance of selected manufacturing firms in Nigeria. *Nigerian Journal of Management Sciences*, 10(2), 75–86.
- [5] Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- [6] Ezeaku, H. C., Nwosu, E. O., & Ugwuanyi, U. B. (2020). Energy input cost and asset efficiency in Nigeria's cement industry. *Energy Economics*, 92, 104958. <https://doi.org/10.1016/j.eneco.2020.104958>
- [7] Ezeaku, H. C., Nwosu, E. O., & Ugwuanyi, U. B. (2019). Energy efficiency, operational cost and firm performance: Evidence from Nigeria's industrial sector. *Energy Policy*, 127, 422–431. <https://doi.org/10.1016/j.enpol.2018.12.014>
- [8] Nwachukwu, A. N., & Akinlabi, B. (2021). Energy efficiency strategies and financial performance: Evidence from Nigerian cement firms. *International Journal of Energy Economics and Policy*, 11(5), 198–207. <https://doi.org/10.32479/ijeep.11568>
- [9] Nwachukwu, A. N., & Akinlabi, B. (2021). Energy efficiency and financial performance of cement manufacturing firms in Nigeria. *International Journal of Energy Economics and Policy*, 11(5), 198–207. <https://doi.org/10.32479/ijeep.11568>

- [10] Okonkwo, O. O., & Ekezie, C. A. (2020). Energy consumption and operational efficiency in Nigerian cement industries. *Energy Reports*, 6, 451–460. <https://doi.org/10.1016/j.egy.2020.09.021>
- [11] Uzonwanne, M. C. (2015). Economic implications of energy insecurity in Nigeria's manufacturing sector. *International Journal of Energy Economics and Policy*, 5(1), 15–23.
- [12] Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171–180. <https://doi.org/10.1002/smj.4250050207>