

## Alternative Source of Power Supply: Implications on Cost of Production in Nigeria

**Chukwuma Victoria Azuka**  
Department of Social Studies  
National Institute for Nigerian Languages Aba  
VickyChris2009@yahoo.com  
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### **Abstract**

*The increasing inadequacy of Nigeria's electricity supply has significantly hindered industrial growth and economic development, driving macro and micro businesses to seek alternative sources of power. This study examines the implications of utilizing alternative power sources on the cost of production in Nigeria. Alternative energy sources, such as solar and biomass, present opportunities for more reliable power, yet their adoption remains slow due to high capital costs, technical challenges, and limited infrastructural support. This study investigates how these alternative power options can mitigate the challenges associated with the unreliable national grid while affecting the cost structures of production in businesses. The study aims to consider the financial and operational consequences of transitioning to alternative power source by focusing on cost, the reliability of supply, and sustainability. The study will adopt energy economics theory and the qualitative method of literature review. This study concludes that although alternative power sources require significant financial investment, they offer long-term benefits in reducing fuel dependency, enhancing production efficiency, and contributing to environmental sustainability. For businesses, the transition to alternative power sources is more than an economic imperative; it is increasingly becoming a competitive advantage.*

**Key Words:** Power supply, Production, Alternative source, solar, cost

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### **Background of the Study**

Nigeria is endowed with abundant natural resources, including renewable energy potentials like solar, biomass, wind, yet the country remains plagued by one of the most unreliable power supply systems in sub-Saharan Africa. Despite reforms and investments by both military and civilian governments aimed at revamping the national grid, electricity generation and distribution have persistently failed to meet the demands of the large population and businesses. Currently, the average Nigerian household and business experiences frequent power outages due to collapsing national grid (Sanni, Oricha, Oyewole & Bawonda, 2021) that happens almost every month in recent time, compelling businesses to rely on petrol and diesel-powered generators, which increase production costs and operational inefficiencies.

In response to this situation, there has been a growing interest in alternative power sources as a solution to Nigeria's energy crisis. These alternatives are seen as important not only for ensuring consistent energy supply but also for reducing cost of production and environmental impacts associated with the overuse of fossil fuels. Nigeria's rich sunlight hours, expansive wind corridors, and untapped biomass potential make it an ideal location for the deployment of alternative power technologies. However, the widespread adoption of these technologies has been hampered by a lack of infrastructure, adequate government support, and high installation costs.

Understandably, the cost implications of alternative power sources for production in Nigeria are still poorly understood. Many businesses are hesitant to invest in renewable energy solutions due to uncertainties about the cost and their return on investment. While initial setup costs are high, the long-term benefits, such as reduced fuel dependency, lower cost of running the business, low maintenance costs, and a more reliable energy supply, have been documented in other countries that have largely adopted it. Yet, in Nigeria, these benefits are still theoretical for businesses. (Oshin, Onile, Adanikin & Fakorede, 2018)

The incessant electric power supply problems constituting problem to the existence of businesses in Nigeria is a pointer to the fact that there is great need for a fault evaluation and reliability assessment of energy system in the country and provide solutions. (Oshin, Onile, Adanikin & Fakorede, 2018) The need for a deeper understanding of how alternative power can reduce the cost of production is critical for businesses, investors, and policy makers. This study focuses on exploring the financial and operational impacts of adopting alternative power source, with particular emphasis on incorporating it into their operations. The findings from this study are expected to provide understanding into how Nigeria's economic sector can better harness alternative power sources to drive growth, enhance productivity, and reduce production costs.

### **Statement of the Problem**

Uninterrupted power supply is a fundamental problem for Nigeria today. (Olujobi, 2022) Nigeria's energy sector is characterized by a complex mix of generating stations, infrastructure challenges, and significant reliance on fossil fuels. The national electricity grid comprises 14 generating stations, including 3 hydro and 11 thermal plants, with a total installed capacity of approximately 8,039 MW. (Oyedepo, 2012) However, despite this installed capacity, the peak electricity supply has often been less than half, leading to regular load shedding and frequent power outages. In 2004, major manufacturing firms recorded 316 outages, with this number increasing by 26% in 2005 and experiencing a staggering 43% rise between 2006 and 2007. (Oyedepo, 2012)

Nigeria's energy crisis has posed severe challenges to businesses across the country. With an estimated 4,000 to 5,000 megawatts of power generation capacity for a population exceeding 200 million people, the national grid remains highly unreliable and inefficient. Frequent collapsing of the national grid, power outages and insufficient electricity supply have become a significant barrier to productivity, leading many businesses to resort to self-generation through costly and environmentally damaging petrol and diesel generators. These traditional power solutions

significantly inflate the cost of production, hindering competitiveness both domestically and internationally.

The reliance on petrol and diesel generators is not only expensive but unsustainable in the long term. The cost is subject to international market fluctuations, and supply chain disruptions can exacerbate the challenges faced by Nigerian businesses. Also, according to Solarin (2020) the environmental impacts, including high carbon emissions and air pollution, make the over-reliance on fossil fuels a critical problem for sustainability and health. For businesses in Nigeria, particularly small and medium-sized enterprises (SMEs), the cost of powering operations often accounts for a disproportionately high share of operational expenses, reducing their profit margins and making it difficult to scale production.

While alternative power sources like solar, wind, and biomass present promising alternatives, they have not been fully embraced in Nigeria. The hesitation stems from several factors: the high initial cost of investment, lack of technical expertise to manage it, and limited government incentives or support for renewable energy adoption. This has led to a situation where many businesses view alternative power sources as an inaccessible luxury rather than a viable solution to Nigeria's chronic power challenges.

The problem this study seeks to address is the gap in understanding the cost implications of alternative power sources on production in Nigeria. Businesses and policymakers lack clear, evidence-based data on the financial and operational benefits of alternative power. Without a detailed analysis of these costs and their impact on production efficiency, businesses remain trapped in a cycle of high-energy costs, reduced productivity, and environmental degradation. The study aims to explore this gap and provide a comprehensive understanding of the role alternative power sources can play in lowering the cost of production, improving reliability, and driving sustainable economic growth in Nigeria.

### **Objectives of the Study**

This study seeks to analyze the implications of adopting alternative sources of power supply on the cost of production in Nigeria. Specifically, the study will:

1. Examine the current energy landscape in Nigeria: The focus is on understanding the extent of the country's energy deficit and the dependence on traditional power sources such as petrol and diesel generators in businesses. This will provide a foundation for understanding why alternative energy solutions are increasingly being considered by Nigerian businesses.
2. Identify the types of alternative energy sources suitable for businesses: The study will investigate various renewable energy technologies, such as solar, wind, biomass, and evaluate their viability in different production environments in Nigeria. This includes analyzing the technological requirements, geographical considerations, and sector-specific energy demands.

3. Assess the financial implications of transitioning to alternative power sources: The focus is to explore the cost structure associated with adopting renewable energy sources. It will include a comparison of the financial investment, operational costs, and maintenance expenses of alternative power sources against traditional power sources. This will provide businesses with a clearer understanding of the potential return on investment.
4. Evaluate the impact of alternative power on production efficiency: The research will examine how alternative power sources influence production processes, with particular emphasis on reducing operational downtime caused by power outages, improving the reliability of supply, and increasing productivity
5. Examine government policies and incentives for alternative power adoption: The aim here is to review the current policy framework and incentive structures provided by the Nigerian government to support renewable energy use. It will evaluate how these policies impact the decision-making process for businesses looking to transition to alternative power sources.
6. Provide recommendations for enhancing alternative energy adoption in Nigeria: Based on the findings, the study will offer practical recommendations for both businesses and policymakers on how to overcome the barriers to adopting alternative power sources, with a focus on cost reduction, technical capacity building.

### **Research Questions**

This study is guided by the following research questions, designed to address the various aspects of the topic concerning the use of alternative sources of power and their impact on production costs for businesses in Nigerian:

1. What are the major causes of Nigeria's power supply challenges, and how have they affected the production costs of businesses?
2. What types of alternative energy sources are available and viable for businesses in Nigeria?
3. How do the costs associated with alternative energy sources compare to those of traditional power solutions like petrol and diesel generators?
4. What impact does the adoption of alternative energy have on production efficiency and operational reliability in Nigerian businesses?
5. What are the current government policies and incentives regarding alternative energy use, and how effective are they in promoting renewable energy adoption?
6. What are the main barriers to the adoption of alternative energy in Nigeria's businesses, and how can they be addressed?

### **Significance of the Study**

The significance of this study lies in its potential to contribute meaningfully to Nigeria's economic and industrial growth by addressing the critical issue of power supply. Nigeria's energy deficit has long been recognized as a fundamental problem to achieving consistent productivity and competitiveness in businesses. This study provides a comprehensive analysis of how alternative sources of power can alleviate the problems caused by the unreliable national grid, reduce operational costs, and bring about sustainable industrial growth.

For businesses, the study offers an understanding into the financial and operational implications of adopting alternative energy solutions. By identifying the specific costs and benefits associated with renewable energy, businesses can make more informed decisions about how to diversify their power sources. This is particularly important for manufacturers which often struggle with the high cost of energy in large-scale power infrastructure. The study's findings can guide these enterprises toward cost-effective energy options that can enhance their long-term profitability and competitiveness.

At policy level, despite the introduction of some renewable energy policies, Nigeria still lags behind in implementing large-scale renewable projects that can significantly reduce reliance on fossil fuels, this research is significant because it provides a path and deeper awareness for Nigerian policymakers to understand the effectiveness (or lack thereof) of current policies and offers recommendations for creating a more robust policy framework that incentivizes alternative energy adoption. It is hoped that by understanding the economic impact of alternative energy on production costs, policymakers will be better equipped to design supportive environments for both investors and industrial players.

For investors and stakeholders in the energy sector, this research underscores the growing importance of alternative energy markets in Nigeria. With the country's vast untapped potential for solar, wind, and biomass energy, there is a significant opportunity for investment in renewable energy infrastructure. By presenting an assessment of the economic returns of such investments, the study can encourage more private-sector participation in renewable energy development, which could further reduce costs for manufacturers.

In terms of sustainability, the study contributes to discussions on environmental preservation and climate change mitigation in Nigeria. As businesses continue to rely on diesel generators and other fossil fuels, the environmental consequences, such as carbon emissions and pollution, gets worse. This study highlights how alternative power sources can help reduce the environmental footprint of industries while still maintaining productive operations. By doing so, this will encourage the adoption of greener energy solutions that align with global sustainability goals and Nigeria's international climate commitments.

As stated above, the significance of this study is multidimensional, offering practical solutions for businesses, actionable paths for policymakers, and valuable opportunities for investors. By bridging the gap between energy supply and industrial production efficiency, this study promotes a more sustainable and economically viable future for Nigeria's production sectors.

## Literature Review

Until recently, many manufacturing businesses in Nigeria relied on fossil fuels to power their operations, which has increased the cost of production and reduced their profit margins. According to Olisah (2023) citing Manufacturer Association of Nigeria-MAN, the high tariff increase in unreliable national grid and fuel/diesel generators drove the cost of production high and lowered profit margin, this consequently lowered revenue remittance to the government among others. Over the past decade, an increasing body of literature has emerged on the connection between energy supply, economic development, especially in countries or several parts of the world where energy insecurity, that is the lack of access to reliable, adequate, affordable and clean source of energy for sustainable livelihood, is prevalent such as Nigeria. (Boateng, et al., 2020) This section of the study provides some relevant studies, shedding light on the current state of knowledge concerning alternative power sources and their impact on production costs in Nigeria.

The Nigerian power sector is plagued by myriads of issues such as lack of reliable power supply, according to a 2021 World Bank report, about 85 million Nigerians do not have constant access to the national grid. (Amoah Twum & Beecham 2024), it further stated that only 13 percent of citizens say they have power that is constant. This has made the adoption of alternative power sources a necessity.

Globally, the transition to alternative power sources otherwise known as renewable energy has been a prominent topic of research. Thai-Ha & Park (2021) and Hernandez (2013) have documented the long-term economic benefits of alternative energy sources in reducing operational costs and increasing energy efficiency, particularly in developing countries such as Nigeria. These studies show that renewable energy solutions, including solar and wind, significantly reduce reliance on fossil fuels and improve the reliability of energy supply. Also, they highlight the role of policy support and government incentives in ensuring the growth of renewable energy markets, emphasizing that without adequate support, alternative energy adoption can be slow and costly for businesses.

Some studies have specifically discussed the energy landscape in Nigeria. Nnaji et al. (2010) highlight the chronic underperformance of the national grid and its impact on Nigeria's industrial sectors. Their work shows that unreliable energy supply contributes to high operational costs for businesses, which spend as much as 40% of their total expenditure on energy-related costs. Ebohon & Ikeme (2016) expanded on this by stating that Nigeria's energy challenges are not solely technical but also political, with corruption and policy inconsistency undermining efforts to improve the energy sector. They emphasize the need for coherent government policies to encourage investment in alternative energy infrastructure.

According to Ogwumike & Solarin (2021) and Baker, Hook & Sovacool. (2021) and have explored the barriers and opportunities related to alternative energy adoption across Africa. These studies reveal that many African countries, including Nigeria, face similar energy supply challenges, characterized by frequent outages and dependency on expensive and polluting generators. According to Ogwumike & Solarin, (2021) the high cost of diesel, its impact on the cost of

production, along with the environmental and health impacts of generator emissions, has created an urgent need for cleaner, more reliable energy alternatives. Their research suggests that solar energy holds particular promise for Nigeria, given its abundant sunlight, but also points to the high initial cost of solar installations as a significant barrier to adoption.

When one looks at the economic implications of transitioning to alternative energy, Alabi et al. (2022) conducted a cost-benefit analysis of solar energy adoption in Nigeria's manufacturing sector, showing that despite high initial capital costs, the long-term savings on fuel and maintenance make it a cost-effective option. Similarly, Adeoye and Oseni (2020) examined the role of alternative energy systems in production, concluding that these systems not only reduce production costs but also improve competitiveness by providing reliable power for industrial activities.

### **Theoretical Framework**

The theoretical framework for this study is grounded in Energy Economics Theory. This framework will guide the analysis of how alternative energy sources impact production costs in Nigeria, as well as the factors influencing the adoption of these technologies.

Energy economics is a subfield of economics that deals with the production, distribution, and consumption of energy resources, focusing on the implications of energy use for economic activity. The theory posits that energy is a fundamental input in the production process, and fluctuations in energy costs or supply can have profound effects on the cost structure of businesses. According to Zweifel, Praktijnjo & Erdmann (2017) and Sweeny (2001) energy economics is crucial for understanding the relationship between energy supply reliability and industrial productivity. The theory asserts that businesses with access to reliable and affordable energy sources can achieve higher levels of productivity and cost efficiency, while those facing energy disruptions or high energy costs experience lower productivity and higher operational expenses.

In the context of Nigeria, Energy Economics Theory explains the current dependence of businesses on expensive, unreliable sources of power such as fuel and diesel generators. The theory also provides a foundation for understanding how the transition to alternative energy sources, such as solar or wind, can reduce production costs over time. By lowering fuel expenses and minimizing power outages, businesses can potentially enhance their competitiveness. The economic concept of **opportunity cost** also plays a role here, as businesses must decide whether the long-term benefits of investing in alternative energy outweigh the short-term financial burdens of high initial capital expenditure.

### **Methodology**

This study employs qualitative literature review method to explore the impact of alternative energy sources on production costs for businesses in Nigeria. The data used are largely secondary data,

that are sourced from reports, energy policy documents, industry publications, and previous academic research on Nigeria's energy sector. These sources will provide contextual information about the energy crisis in Nigeria, government initiatives to promote renewable energy across the manufacturing industry

This approach will allow for a comprehensive analysis of both the financial and operational implications of renewable energy adoption, as well as the broader contextual factors influencing the energy landscape in Nigeria.

### **Discussion of Findings**

The findings of this study reveal several critical areas about the use of alternative energy sources in Nigeria and their implications for production costs across manufacturing industries. The views expressed from the secondary sources indicate that while the country's energy crisis continues to be a major obstacle to industrial growth, alternative energy solutions offer a viable pathway to reducing operational costs and improving production efficiency.

#### ***Energy Supply Challenges in Nigeria***

As reported by Nairametrics, the national grid has collapsed for the tenth time in 2024. (Ademola, 2024) The frequent outages in the country not only disrupt industrial activities but also contribute to an annual loss estimated at US\$29 billion due to power outages, exacerbating issues of poverty and unemployment across the nation. (Punch, 2024) The inefficient management of the energy sector has resulted in substantial power losses and illegal access to public electricity, further underscoring the systemic challenges faced by the industries. (Eweka, Lopez-Arroyo, Medupin, Oladipo, 2022)

The study confirms that Nigeria's unreliable energy supply, characterized by frequent outages and high fuel costs for diesel generators, is a primary driver of elevated production costs. Nigeria's power sector has been plagued by inefficiencies, leading to frequent power outages and unreliable electricity supply. This has forced many businesses to rely on other power sources, primarily petrol and diesel generators, which are costly and environmentally detrimental. (Adebobola, Adetunmbi, & Omoniyi, 2023, Akinwumi, Moses, & Akinbami, 2006). Businesses across all sectors reported spending a significant proportion of their operational budgets on energy, with many companies highlighting that power interruptions lead to substantial downtime, equipment malfunctions, and delayed production schedules. The national grid's instability continues to force industries to rely on expensive and polluting diesel generators, which further exacerbate the cost burden.

From a policy standpoint, the findings show that government initiatives aimed at improving grid stability and increasing energy access have largely failed to meet the growing demands of the industrial sector. (Arowolo & Perez, 2020) While reforms in the Nigerian power sector have been ongoing, corruption, bureaucratic delays, and inconsistent policy implementation have hindered



meaningful progress. Consequently, the industrial sector has been forced to explore alternative energy sources, despite the high initial costs.

### *Adoption of Alternative Energy Sources*

Alternative power sources in Nigeria include a variety of renewable energy technologies and strategies aimed at enhancing energy efficiency and reducing reliance on fossil fuels, and worldwide adoption has grown in recent years. (Adelaja, 2020) These sources are important for ensuring reliable energy supply and sustainable development. Despite the challenges, there is an emerging trend towards renewable energy and energy efficiency practices. Businesses in Nigeria, especially manufacturers have recognized the necessity for the use of alternative resources and energy-efficient technologies to reduce the cost of production. According to the Manufacturers Association of Nigeria-MAN, manufacturers spent over 60 billion naira on alternative energy in the first half of 2023. (Ikpoto, 2023)

The study's findings reveal that solar energy is the most commonly adopted alternative energy source among Nigerian businesses, especially in regions with high solar radiation such as the northern and southwestern parts of the country. Solar energy is harnessed primarily through solar photovoltaic (PV) systems, which convert sunlight directly into electricity using silicon solar cells. (Williams, et al, 2019) This method is increasingly adopted due to its potential to provide clean and sustainable power, especially in regions with abundant sunlight.

While it is costly to install initially, it can result in significant cost savings over time by reducing reliance on diesel generators and the collapsing national grid. Businesses that have invested in solar energy report fewer power outages, lower fuel costs, and increased operational reliability. (Daus, et al., 2019) However, wind and biomass energy remain underutilized due to lack of infrastructure and government support.

Despite these advantages, the study also identifies several challenges that hinder widespread adoption of renewable energy. High upfront costs remain a critical barrier, particularly for small and medium-sized enterprises (SMEs) that lack the capital required for large-scale energy investments. Additionally, the lack of technical expertise and reliable maintenance services has led to operational inefficiencies for businesses attempting to transition to renewable energy.

### *Cost Comparisons and Production Efficiency*

The power from alternative sources such as solar, wind, biomass etc are considered more cost saving and effective than using fossil or nuclear fuels, by businesses. (Twidell, 2021) The study of Melnyk, et al. (2020) reveals that businesses that have adopted alternative energy sources experience a reduction in overall energy costs over the long term. For example, solar-powered businesses, report a 30–50% reduction in energy expenses after the first two years of installation, as the cost of maintaining solar systems is significantly lower than the fuel and maintenance costs of diesel generators. Also, businesses that use alternative energy experience fewer disruptions, which translate into more consistent production times and higher output.

However, the study finds that Industries that require high energy input, such as manufacturing and heavy industries, continue to rely on hybrid energy systems, combining solar power with diesel generators to ensure consistent energy supply. This is primarily due to the fact that solar energy alone may not be sufficient to meet the energy demands of large-scale operations, particularly during periods of low sunlight.

### ***Policy and Incentive Effectiveness***

The evaluation of government policies reveals that while there are several initiatives aimed at promoting renewable energy in Nigeria, such as the National Renewable Energy and Energy Efficiency Policy (NREEEP), National Energy Policy, and National Policy for Renewable Electricity, the actual impact of these policies has been limited. Most businesses reported that current government incentives, such as tax breaks and subsidies, are either inaccessible or insufficient to offset the high initial costs of adopting alternative energy solutions. Also, the regulatory framework for renewable energy remains fragmented, with difficulties in following the bureaucratic hurdles to access government support.

In summary, the findings suggest that while alternative power sources offer a viable solution to Nigeria's energy crisis and can significantly reduce production costs for industries, there are still substantial barriers to widespread adoption. These barriers include high upfront costs, inadequate government support, and technical challenges. Nonetheless, businesses that have successfully transitioned to alternative energy report improved cost efficiency and operational reliability.

### **Recommendations**

Based on the findings of this study, the following recommendations are proposed to encourage the adoption of alternative energy sources in Nigeria and reduce production costs across businesses:

#### **1. Government Policy Reform**

The Nigeria Power sector reforms which as has performed at suboptimal level has undoubtedly been adjudged unsuccessful by stakeholders, with issues arising from underdeveloped infrastructure, ineffective regulatory framework, access and pricing, and overall sectoral underperformance. (Arowolo, & Perez, 2020) To address the significant barriers to alternative power supply, the Nigerian government needs to reform its current energy policies and create a more conducive environment for renewable energy investments. This includes streamlining the policy and regulatory framework to make it easier for businesses to access incentives. The availability and accessibility of financial incentives, such as grants, subsidies, and low-interest loans, to help businesses offset the high initial costs of installing renewable energy systems. Additionally, policymakers should consider introducing mandatory energy efficiency standards for industries, encouraging businesses to invest in energy-saving technologies alongside renewable energy solutions. Such measures would reduce overall energy consumption and further lower

production costs. By providing clear, consistent policies, the government can attract both local and international investors to the renewable energy sector.

## **2. Public-Private Partnerships (PPP)**

Nigerians expect the government to meet their rising energy infrastructural needs, (Obuebite, Nwosi-Anele, & Okwonna, 2021), however, given the high capital costs of alternative sources of power supply, the Nigerian government should facilitate public-private partnerships that allow businesses to share the financial burden of adopting alternative energy sources. These partnerships could take the form of energy-as-a-service models, where private companies finance, install, and maintain renewable energy systems for businesses in exchange for a long-term energy supply contract. This would reduce the upfront costs for businesses while providing a reliable, cost-effective source of power.

Additionally, PPPs could be used to expand the availability of technical expertise in the renewable energy sector. The government could collaborate with private companies and educational institutions to establish training programs for technicians and engineers, ensuring that businesses have access to the skills needed to install and maintain renewable energy infrastructure.

## **3. Increased Investment in Alternative Energy Infrastructure**

Alternative sources of power supply have proven to be viable and widely adopted around the world. To further encourage its adoption in Nigeria, both the government and private sector should increase investments in this kind of energy infrastructure, which largely require the use of active state investment policy and private contribution (Onyshchenko & Sivitska, 2014). This includes expanding solar farms, improving the efficiency of solar panels, and developing better battery storage systems to ensure consistent energy supply even during periods of low sunlight.

The government could also invest in research and development to improve the cost efficiency of solar energy and other alternative energy technologies. By supporting innovation in this sector, Nigeria can reduce the costs associated with renewable energy adoption and increase its competitiveness in the global renewable energy market.

## **4. Targeted Support for Manufacturers in the Country**

Manufacturers represent a significant portion of Nigeria's industrial sector but often lack adequate support from the government to invest in alternative energy solutions. They can benefit from the cost saving and competitive advantage factors. (Suleiman, 2023) The government should establish targeted support programs for them, offering financial support, technical expertise, and streamlined regulatory processes to help them transition to alternative energy. By reducing the energy costs for manufacturers, the government can enhance their competitiveness and promote economic growth.

These recommendations can provide a roadmap for encouraging the adoption of alternative energy sources in Nigeria. By addressing the financial, technical, and policy-related barriers identified in

this study, Nigeria manufacturers can reduce production costs, improve industrial efficiency, and transition toward a more sustainable energy future.

### **Summary/Conclusion**

The energy crisis in Nigeria has emerged as a significant obstacle to the country's industrial growth, with frequent power outages and high energy costs severely impacting production efficiency and economic performance. This study explored the implications of alternative energy sources on production costs in Nigeria, focusing on renewable energy solutions such as solar, wind, and biomass. Through a qualitative literature review approach the study provided a comprehensive analysis of the potential cost-saving benefits for the industrial sector.

The findings reveal that the reliance on traditional power solutions, particularly diesel generators, has driven up operational costs for businesses across various industries. This reliance stems from the unreliability of the national grid and the prohibitive costs associated with fuel and maintenance for diesel systems. Hence, manufacturers are investing in renewable energy, especially solar power experience significant reductions in energy costs and improved production reliability, as well as a marked improvement in operational efficiency due to fewer power outages.

However, the study also identifies substantial barriers hindering the widespread adoption of alternative energy in Nigeria. High upfront costs of installation remain a major challenge for many businesses, particularly manufacturers. In addition, inadequate technical expertise and unreliable maintenance services pose significant obstacles for businesses attempting to transition to renewable energy systems.

Furthermore, the evaluation of government policies reveals that existing policies aimed at promoting renewable energy are often ineffective due to bureaucratic hurdles, inconsistent implementation, and insufficient financial incentives. While there are policies in place, there are difficulties in accessing support, resulting in a lack of meaningful progress toward renewable energy adoption.

To address these challenges, the study offers several recommendations. First, the Nigerian government must reform its energy policies to create a more supportive policy and regulatory environment for renewable energy investments. This includes streamlining and enhancing the availability of financial incentives such as grants and low-interest loans. Establishing public-private partnerships could also facilitate shared investment in renewable energy systems, helping to alleviate the financial burden on businesses.

In conclusion, while Nigeria faces significant energy challenges, the adoption of alternative energy sources presents a viable solution to reduce production costs and improve industrial efficiency. By addressing the barriers to renewable energy adoption through effective policy reforms, public-private partnerships, and targeted support for concerned businesses, Nigeria can transition toward

a more sustainable energy future. This transition will not only benefit businesses but will also contribute to the economic development and environmental sustainability of the nation.

## References

- Adebobola, T., Adetunmbi, A., & Omoniyi, O. (2023). Cost challenges facing Nigerian manufacturing industries using generating sets as main source of power supply. *ABUAD Journal of Engineering Research and Development (AJERD)*. <https://doi.org/10.53982/ajerd.2023.0601.03-j>.
- Adelaja, A. O. (2020). Barriers to national renewable energy policy adoption: Insights from a case study of Nigeia. *Energy Strategy Reviews*, 30(1), 105-119.
- Ademola, C. (2024). Breaking: Blackout as national grid collapses for the tenth time in 2024. <https://www.nairametric.com/2024/11/07/breaking-blackout-as-national-grid-collapses-for-the-tenth-time-in-2024>
- Akinwumi, I., Moses, R., & Akinbami, J. (2006). Electric power supply strategies and productivity in selected manufacturing industries in Nigeria. *Journal of Resources, Energy, and Development*, 3, 107-128. <https://doi.org/10.3233/RED-120034>.
- Amoah Twum, M. A., & Beecham, E. O. (2024). AD814: Nigerians lack reliable electricity, leaving most discontent with government efforts. <https://www.afrobarometer.org/publication/ad814-nigerians-lack-reliable-electricity-leaving-most-discontent-with-government-efforts>
- Arowolo, W., & Perez, Y. (2020). Market reform in the Nigeria power sector: A review of the issues and potential solutions. *Energy Policy*, 144, 111580.
- Baker, L., Hook, A., Sovacool, B. K. (2021). Power struggles: Governing renewable electricity in a time of technological disruption. *Geoforum*, 118, 93-105.
- Boateng, G. O., Balogun, M. R., Dada, F. O., Armah, F. A. (2020). Household energy insecurity: Dimensions and consequences for women, infants and children in low-and middle-income countries. *Social Science & Medicine*, 28.
- Daus, Y., Yudaev, I. V., Taranov, M. A., Gazalov, V. S., (2019). Reducing the costs for consumed electricity through the solar energy utilization. *International Journal of Energy Economics and Policy*, 9(2), 19-23.
- Eweka, E. E., Lopez-Arroyo, E., Medupin, C. O., Oladipo, A., & Campos, L. C. (2022). Energy landscape and renewable energy resources in Nigeria: A review. *Energies*. 15(15), 5514. <https://doi.org/10.3390/en15155514>

- Hernandez, D. (2013). Energy insecurity: A framework for understanding energy, the built environment, and health among vulnerable populations in the context of climate change. *American Journal of Public Health*, 103(4), e32-e34.
- Ikpoto, E. (2023). Manufacturers spend N60bn on alternative energy in six months-MAN. <https://www.punchng.com/manufacturers-spend-N60bn-on-alternative-energy-in-six-months-MAN>
- Melnyk, L. H., Sommer, H., Kubatko, O. V., Rabe, M., & Fedyna, S. M. (2020). The economic and social drivers of renewable energy development in OECD countries. *Business Perspectives in Management*, 18(4), 37-48.
- Obuebite, A. A., Nwosi-Anele, A., & Okwonna, O. (2021) Public private partnership (PPP) and the provision of infrastructure in Nigeria: A case for energy mix sector in the Niger-Delta. *International Journal of Petroleum and Petrochemical Engineering*, 7(1), 11-20.
- Olisah, C. (2023). MAN says manufacturers spent 144 billion on alternative electricity supply, opposes tariff hike. <https://www.nairametric.com/2023/06/23/man-says-manufacturers-spent-n144-billion-on-alternative-electricity-supply-opposes-tariff-hike>
- Olujobi, O. J. (2022). Legal analysis of erratic supply of electricity in Nigeria: Is renewable energy a true alternative? *Redeemer's University Journal of Jurisprudence and International Law*, 2(1), 14-33.
- Onyshchenko, V., & Sivitska, S. (2014). Alternative energy developing investment support in terms of energy dependence. *Economic Magazine*, 10(1), 34-37.
- Oshin, O. A., Onile, A. E., Adanikin, A., & Fakorede, E. (2018). Reliability of distribution networks in Nigeria: Ikorodu, Lagos State as a case study. *International Journal of Engineering and Emerging Scientific Discovery*. 3(4), 20-33.
- Punchng (3 November, 2024). Blackout, a national security threat. <https://www.punchng.com/blackout-a-national-security-threat>
- Sanni, S. O., Oricha, J. Y., Oyewwole, T. O., & Bawonda, F. I. (2021). Analysis of backup power supply for unreliable grid using hybrid solar PV/diesel/biogas system. *Energy*, 227, 120-156.
- Solarin, S. A. (2020). An environmental impact assessment of fossil fuel subsidies in emerging economies. *Environmental Impact Assessment Review*, 85, 106-143.

- Suleiman, U. G. (2023). Effect of renewable energy development on sustainable development of small and medium enterprises potentials in Nigeria. *Research Journal of Business and Economic Management*, 6(1), 1-11.
- Sweeny, J. L. (2001). Energy economics. *International Encyclopedia of the Social & Behavioural Sciences*, 4513-4520.
- Thai-Ha, L. & Park, D. (2021) What drives energy insecurity across the world? A panel data analysis. *Energy Research & Social Science*, 77.
- Twidell, J. (2021). Renewable energy resources. *Routledge*.
- Williams, E. A., Olalekan, R. M., Yarwamara, E. I., & Oshatunberu, M. (2019). Renewable energy sources for the present and future: An alternative power supply for Nigeria. *Energy and Earth Science*. 2(2), <https://doi.org/10.22158/ees.v2n2p18>
- Zweifel, P., Praktijnjo, A., & Erdmann, G. (2017). Energy economics: Theory and applications. Springer.