



Impacts of electricity subsidy removal on renewable energy security utilization in Nigeria 2023-2026

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Abstract

The removal of electricity subsidies in Nigeria would have a profound impact on the adoption of renewable energy sources, energy affordability and consumer behaviour. This study investigates the effects of the discontinuation of subsidies on the consumption of renewable energy, focusing on consumer reactions, investment patterns, and electricity prices. The study uses a mixed-methods approach including consumer surveys, key informant interviews, and time-series econometric analysis to assess the effects of subsidy reductions on renewable energy adoption and electricity demand. According to the results, the average electricity cost has increased by 65% for industrial users and 50% for residential consumers. This has resulted in a decline in power consumption and a rise in interest for alternative energy solutions. However, despite a 25% increase in solar photovoltaic (PV) capacity since 2020, widespread use of renewable energy is still hampered by economic restraints and regulatory barriers. The study emphasizes the need for targeted policy initiatives that include financial incentives, stronger regulatory structures, and social protection measures to benefit low-income customers. Lessons from the world show that to encourage investment in renewable energy and maintain the affordability of electricity, structured incentives must be incorporated into subsidy reform. "While the analysis points to challenges in reducing power subsidies, it additionally points out the opportunity to accelerate Nigeria's transition to a more sustainable and resilient energy system. Public-private partnerships need to be improved, off-grid solutions need to be expanded to fully take advantage of subsidy reduction.

Keywords: Electricity subsidy removal, Renewable energy adoption, Energy transition, Electricity pricing, Energy policy

Introduction

Access to energy is a major driver of economic growth and development especially in developing countries such as Nigeria. For many years, the Nigerian government subsidized electricity to make it affordable for households and enterprises. Nevertheless, this policy has created many issues such as the financial burden to the government, inefficiency in the energy sector and the absence of investment in infrastructure. Hence, there is an increased debate over the sustainability of the electricity subsidies and the need for reforms in policy to promote a more efficient and sustainable energy sector. The gradual reduction of subsidies for electricity is one big policy shift of late that's expected to have a major impact on energy consumption patterns, tariff structures and renewable energy investments.

The challenges and prospects of Nigeria's energy transition in the removal of electricity subsidies the rising costs of electricity could put a financial burden on consumers on one hand, especially the low-income and small business consumers. In contrast, it provides an opportunity for the renewable energy sector to grow by making alternative energy sources such as solar and wind power more competitive. In many countries the reduction or elimination of fossil fuel subsidies has gone hand in hand with increased investment in renewables, as market conditions move towards more sustainable and economically viable alternatives. Nigeria has abundant renewable energy

potential and could leverage this transition to diversify its energy mix, cut down on dependence on fossil fuels and boost energy security.

Despite the potential benefits, several factors might hinder the transition to renewable energy once electricity subsidies are phased out. Major impediments continue to be substantial upfront costs, limited funding options, inadequate policy support and infrastructure constraints. Moreover, the degree to which society is aware of and conscious about the adoption of renewable energy alternatives has a substantial impact on the willingness of consumers and businesses to switch to renewable energy sources. It is important to understand the implications of withdrawing subsidies on renewable energy usage, the challenges and the policy frameworks that need to be in place to enable a smooth transition.

Objective of the study

The aim of this study is to examine the effect of the removal of electricity subsidies on the renewable energy consumption in Nigeria. Its purpose is to explore the impact of subsidy removal on consumer behaviour, electricity pricing and investment in renewable energy technologies. The research will also look at policy measures that can allow a sustainable transition, so as to ensure that renewable energy becomes a viable alternative for Nigerian households and businesses. The results will be a

valuable contribution to the ongoing debate on energy reform in Nigeria and will provide valuable information to policymakers, investors and stakeholders in the energy sector.

Literature review

The impact of the elimination of electricity subsidies on the use of renewable energy has been extensively studied in local and global settings. Historically, governments have used energy subsidies to reduce the price of electricity. However, these subsidies tend to create inefficiencies, fiscal stress and impede investment in alternative energy sources (Coady *et al.*, 2019) ^[9]. Nigeria has, in the past, like many other developing countries, relied on subsidies to keep electricity costs low. However, the policy has created significant budgetary pressures and distortions on the energy market that have limited investments in renewable energy by the private sector (Adenikinju, 2020) ^[3]. The removal of these subsidies is expected to change the country's energy landscape and create both opportunities and challenges for the uptake of renewable energy.

Electricity subsidy removal: global experiences and lessons

In the real world, research shows the end of subsidies has had a different impact on renewable energy use in different countries. In Indonesia, electricity subsidies were phased out and the private sector invested much more heavily in solar power, especially in rural areas where grid power was becoming more expensive (Bridle & Kitson, 2020) ^[7]. India's government also cut subsidies to fossil fuels and ramped up support for renewables, leading to a large increase in capacity for solar and wind power (Chakravarty & Tavoni, 2021) ^[8]. However, examples from Egypt and Venezuela showed that removal of subsidies can increase energy poverty if policymakers do not respond to it because people will be faced with higher electricity bills and no good alternatives (El-Katiri & Fattouh, 2017) ^[12]. The case studies indicate that more policies are required to deal with the negative consequences of subsidy reform, such as targeted incentives for renewable energy and social protection programs.

The Nigerian context: challenges and opportunities for renewable energy

The Nigerian power sector is still predominantly dependent on fossil fuels, and subsidies have historically played a major role in keeping electricity prices artificially low (Ohiare, 2022) ^[17]. The Nigerian government, however, has faced rising fiscal pressures and has sought to remove electricity subsidies and introduce cost-reflective tariffs (Olugbenga & Adepoju, 2021) ^[18]. The policy shift is expected to reduce government expenditure and improve efficiency in the power sector. However, it also raises concerns about affordability especially for low income households and small businesses. Removal of subsidies without adequate policy support could lead to increased energy poverty by decreasing electricity access for vulnerable populations (Adelabu, 2018) ^[2].

Conversely, the end of subsidies provides an important opportunity for renewable energy investment. Increasing grid

electricity prices are making renewable energy technologies like the solar photovoltaic (PV) systems, mini-grids, and wind power more competitive. Researches indicate that Nigeria has a great potential of solar energy particularly in the northern part of the country where the level of solar radiation is one of the highest in Africa (Sambo, 2019) ^[19]. However, limited financing options, lack of infrastructure and regulatory bottlenecks continue to impede the large-scale deployment of renewable energy solutions (Akinyele *et al.*, 2020) ^[4].

Theoretical framework: energy transition and market liberalization

The concept of energy transition theory is a useful lens to understand the impact of subsidy removal on renewable energy uptake. Energy transition theory posits that energy systems change in stages, influenced by economic, technological and policy factors. The transformation of subsidies has been crucial in the energy transition of many countries, by bringing the renewable energy sources to compete with the fossil fuel-based electricity production (Sovacool, 2021) ^[20]. Another important theoretical perspective is the market liberalization theory. This theory claims that the removal of subsidies can result in a competitive electricity market that encourages investments in greener energy solutions as consumers and businesses look for cheaper and sustainable solutions (Borenstein and Bushnell, 2019) ^[5].

Methodology

The study uses a mixed-method research approach to examine the effect of renewable energy use in Nigeria on the reduction of power subsidies. The approach integrates quantitative and qualitative methodologies to generate a comprehensive insight into the effect of subsidy withdrawal on electricity pricing, customer behaviour and investment in renewable energy technology. The methodology, data, analytical techniques and research strategy are described, and the rationale for their selection is explained.

Research design

An approach based on mixed methods is used, to get both contextual insights and numerical trends on subsidy removal and renewable energy adoption. The quantitative part consists of an analysis of time-series data on electricity pricing, subsidy spending and renewable energy investments for the last two decades (2000-2023). The qualitative part comprises key informant interviews of stakeholders in the energy sector that include government officials, renewable energy investors and electricity consumers as well as policy document analysis. The researchers could understand the topic better by combining these approaches (Creswell & Plano Clark, 2018) ^[11].

Data sources

The study relies on both primary and secondary data sources:

Secondary data

- **Government and institutional reports:** Data on electricity subsidies, pricing regimes and investments in

renewable energy are collected from the Nigerian Electricity Regulatory Commission (NERC), the Federal Ministry of Power and the Central Bank of Nigeria (CBN).

- **International organizations:** Comparative perspectives on global subsidy reform efforts are available from the International Energy Agency (IEA), the World Bank and the International Renewable Energy Agency (IRENA).
- **Scholarly publications and policy reports:** Relevant research, journal articles, and policy documents are reviewed to place findings within the framework of the existing literature.
- **Statistical data:** Time-series data on electricity consumption, renewable energy capacity, and government subsidy expenditures are sourced from the National Bureau of Statistics (NBS) and the Nigerian Electricity System Operator (NESO).

Primary data

Semi-structured interviews (KII) are carried out with policymakers, energy specialists, renewable energy entrepreneurs and consumer advocacy organizations. The interviews offer qualitative insights into the challenges and opportunities of phasing out subsidies. To gauge the impact of subsidy removal on the energy decisions of electricity consumers from diverse income levels, a systematic survey was undertaken. The questionnaire includes questions about the cost of electricity, willingness to adopt renewable energy and perceived barriers to the transition.

Analytical Techniques The study employs several analytical techniques to interpret the data collected:

- **Descriptive & Trend analysis:** Statistical analysis is performed to find trends in electricity pricing, subsidy expenditures and renewable energy investment pre and post subsidy removal. In this part, key trends and patterns are illustrated using data presentation techniques such as graphs and charts.
- **Qualitative content analysis:** Thematic analysis (Braun & Clarke, 2019) is used to analyze interview transcripts and policy documents to identify recurring themes and policy views on subsidy removal and renewable energy development.

Justification for methodology

We adopt a mixed-methods approach as it integrates quantitative data with contextual information on the effects of subsidy removal on renewable energy uptake. Empirical trend analysis is carried out using quantitative methods. Qualitative methods are used for stakeholder perspectives, policy barriers and consumer attitudes. This combination guarantees an in-

depth analysis that considers macroeconomic impacts and local realities (Creswell, 2014) ^[10].

Findings

A clear price–demand relationship

The abolition of electricity subsidies in Nigeria has shown direct correlation between electricity prices and consumer demand. Economic theory predicts that the demand for a good will fall as the price rises, especially if there are alternatives available for consumers. The study’s evidence indicates that the removal of subsidies and the subsequent substantial hike in electricity tariffs have significantly affected the consumption patterns of households, businesses and industries.

The results show that the electricity tariffs of the residential consumers increased by about 50%, the tariffs of the small and medium-sized enterprises (SMEs) grew by 58%, and the tariffs of the industrial users increased by 65%. Therefore, many consumers changed their behaviour in an effort to adapt to the increasing cost of electricity. The survey found that 67 percent of respondents cut electricity use and 72 percent were concerned about affordability. The answers given here show a direct price-demand relationship where an increase in the price of electricity increases the demand for electricity. This pattern follows the principle of price elasticity of demand, which suggests that when the price of a commodity increases substantially, it is probable that consumers will reduce their usage.

The rise in electricity tariffs has also prompted consumers to explore alternative energy sources. Around 45% of respondents indicated an increased use of renewable energy technologies, such as mini-grids and solar photovoltaic systems. This means that not only is the demand for grid electricity being reduced but the rising prices of electricity are also stimulating the demand for renewable energy alternatives. This has, in turn, changed consumer preferences and made renewable energy options more attractive.

The response to higher electricity prices is different among income groups, however. The wealthier households and businesses can invest in alternative energy systems, but the low-income consumer has often limited options and may face greater energy insecurity. Hence, although the price-demand relationship is evident, its effects are unevenly distributed among different segments of society.

Overall, the study confirms that removal of electricity subsidy has established a clear inverse relationship between electricity prices and demand in Nigeria. The higher tariffs have cut electricity consumption but at the same time have incentivized the use of renewable energy, thus reshaping the country’s energy consumption landscape.

Table 1: Direct price shocks by consumer segment

Consumer category	Tariff increase (%)	Primary consequence
Industrial Users	65	Higher production costs; reduced profitability
Small Businesses (SMEs)	58 (operational burden)	Shift toward alternative energy
Residential Consumers	50	Reduced affordability; lower consumption
Rural Consumers	Moderate to High	Heightened energy poverty risk

Source: Author’s reordering of NERC (2023) data

Table 1 shows that subsidy removal imposed asymmetric price shocks: industrial users (+65%) and SMEs (+58%) faced steeper increases than residential consumers (+50%). Rural consumers, though not given a precise percentage, are flagged for “moderate to high” increases – a vagueness that itself indicates data limitations.

Consumer coping strategies

The sudden increase in electricity tariffs after the removal of subsidies has led consumers from different socio-economic groups to resort to various coping methods to deal with the rising energy costs. With electricity prices rising, both consumers and businesses are faced with tough choices about the use of energy, spending priorities and alternative energy sources. Economic theory tells us that a big increase in the price of a basic product will cause a change in consumption behaviour to reduce the economic pressure. In the Nigerian context, these changes have been very prominent because of the huge tariff hikes that residential, commercial and industrial consumers have witnessed.

Evidence from the consumer survey shows that rising electricity costs have had a significant impact on household

welfare and business activities. Many consumers struggled to pay their monthly electricity bills, which resulted in changes to their consumption behaviour and increased reliance on alternative energy solutions. Households are more aware of their use of energy by using less of what they don't need, using less high energy appliances and adopting energy saving practices. Small businesses have been looking at ways to cut operational costs by optimizing their electricity usage and exploring alternative power sources like solar power and generators as well.

The results indicate that the increased financial strain of higher electricity tariffs has created widespread concerns about affordability and energy security. While some consumers have adapted well, investing in renewable energy technologies, others have had difficulty coping with limited financial resources. In consequence, the abolition of subsidies on electricity has not only affected the demand for electricity but also influenced consumer perceptions of energy use, payment habits, and the use of alternative energy sources. The different strategies consumers use to overcome these challenges are presented in Table 2.

Table 2: Consumer coping strategies (ranked by prevalence)

Response	% of respondents	Implication
Complaints about affordability	72	Household budget strain
Reduced electricity consumption	67	Energy-saving behaviour
Increased use of alternative energy	45	Growing interest in renewables
Delayed bill payments	39	Financial stress
Illegal connections	18	Threat to sector sustainability

Source: Field survey (2026)

The behavioural response is measured in Table 2. Surveyed consumers complain about affordability (72%) and report a reduction in consumption (67%), classic price elasticity response in a necessity good. Encouragingly, more than a third (35%) say they are using more alternative energy and 45% say they are using alternative energy more often. Higher grid tariffs are already affecting preferences towards renewables.

Renewable energy growth

Table 3 Growth path of some selected renewable energy indicators in Nigeria 2020-2023. The data shows a positive trend in the adoption and investment of renewable energy which indicates that the gradual transition to alternative energy sources has been facilitated by the removal of electricity subsidies and the subsequent increase in electricity tariffs. With the rising cost of grid electricity, households, businesses, and investors are increasingly favouring renewable energy technologies as viable and cost-effective solutions to their energy requirements (Ohiare, 2022; Sovacool, 2021) ^[17, 20].

The most significant development that was observed during the study period was the substantial increase in the adoption of solar home systems. Between 2020 and 2023, the number of solar home systems installed increased by 71%, from 210,000 units to 360,000 units. Such expansion indicates that consumers' interest in decentralized energy solutions is

growing, especially among households that are struggling to access a reliable supply of electricity amid frequent power outages and rising grid electricity costs. The growth of solar home systems (IRENA, 2023) ^[15] also indicates the increased awareness of the economic benefits and environmental sustainability of renewable energy technologies over the long term.

The number of mini-grid projects also increased, from 85 to 132, or a 55 percent growth rate during the period under review. Mini-grid infrastructure expansion is an indicator of increasing efforts to expand electricity access, particularly in rural and underserved communities where grid connection remains limited. Mini-grids are a key part of Nigeria's renewable energy strategy because they provide reliable electricity and reduce dependence on traditional power sources (Akinyele *et al.*, 2020) ^[4].

Investment in renewable energy also rose significantly, from ₦120 billion in 2020 to ₦185 billion in 2023, an increase of 54 per cent. The rise reflects positive investor response to market opportunities from subsidy reforms and the increasing demand for alternative energy solutions. Investment is needed more to develop the infrastructure for renewable energy, to boost technological innovation and to improve the overall sustainability of the energy sector (Olugbenga & Adepoju, 2021) ^[18].

But the installed solar photovoltaic (PV) capacity only grew from 100 MW to 125 MW, a 25 percent increase, despite the impressive rates of growth. The growth is exciting, but it also points out how small Nigeria's renewable energy sector is compared to the country's total electricity demand and to the achievements of other developing economies. The findings thus indicate that while renewable energy is growing, the sector is still evolving from a low base and requires more policy support, financing mechanisms and infrastructure investment to have a transformational impact on national energy supply (IRENA, 2023; Sambo, 2019) ^[15, 19].

Trend analysis: renewable growth but from a low base

The removal of electricity subsidies has made it possible for the adoption of renewable energy to gradually increase in Nigeria especially in the solar energy sector. The increasing electricity tariffs have made renewable energy technologies more competitive and encouraged households, companies and investors to consider alternative energy solutions. Renewable energy systems like solar home systems, mini-grids and solar photovoltaic (PV) installations are considered as viable alternatives to conventional grid electricity which is increasingly becoming expensive and unaffordable to an increasing number of consumers (Ohiare, 2022; Sovacool, 2021) ^[17, 20].

In the analysis of renewable energy indicators between 2020 and 2023, there is a positive growth in all measured variables. During the period there was a significant expansion of mini-grid projects, and a substantial increase in the uptake of solar home systems. Similarly, the vigorous increase of investments in renewable energy projects showed the need for alternative sources of power and the growing confidence of investors. These trends illustrate how the rise in electricity costs provides economic incentives for consumers and businesses to seek energy solutions with longer-term cost savings and increased reliability (IRENA, 2023; Akinyele *et al.*, 2020) ^[15, 4].

However, these positive trends must be read against the backdrop of Nigeria's relatively small base of renewable energy. And while the percentage increases are impressive, the absolute amount of renewable energy capacity remains small relative to the country's overall energy needs and international benchmarks. Installed solar PV capacity has grown considerably during the study period but the total capacity does not yet make a meaningful change to Nigeria's energy mix or resolve the country's persistent deficit in electricity supply (IRENA, 2023; Sambo, 2019) ^[15, 19].

Also, the trend observed in the uptake of renewable energy suggests that a considerable number of consumers are inclined to invest in small-scale systems which are mainly aimed at fulfilling basic household energy needs, as opposed to large-scale installations that can back up productive economic activities. This trend points to the financial challenges that many Nigerians interested in renewable energy options have to confront, as they usually do not have access to cheap financing. Therefore, the observed growth is a key step towards energy diversification but also points to the need for more robust policy support, better funding models and increased investment

in renewable energy infrastructure (Akinyele *et al.*, 2020; Olugbenga & Adepoju, 2021) ^[4, 18].

The trend therefore shows that the use of renewable energy is increasing as a consequence of the removal of subsidies on electricity but the sector is still growing from a relatively low base. To sustain growth, specific measures are needed to reduce financial barriers, strengthen regulatory structures, and encourage large-scale renewable energy deployment. Such measures are important in ensuring that renewable energy can meaningfully contribute to Nigeria's long-term energy security and sustainable development goals (Sovacool *et al.*, 2022; Geels, 2019) ^[21, 13].

Table 3: Renewable energy growth (2020–2023)

Indicator	2020	2023	% Change
Solar Home System Adoption (units)	210,000	360,000	+71%
Mini-grid Projects (count)	85	132	+55%
Renewable Energy Investments (₦ billion)	120	185	+54%
Installed Solar PV Capacity (MW)	100	125	+25%

Source: IRENA (2023) ^[15] & Nigerian investment records

Table 3 Real progress is being recorded: adoption of solar home systems increased by 71%, mini grid projects by 55% and total renewable energy investments by 54% (in nominal naira). Solar PV installed capacity grew by only 25% – a low absolute increase (100MW to 125MW) that reflects the nascent base of renewable in Nigeria. By way of context, South Africa had more than 6 GW of installed solar PV by 2023. The 25% growth is statistically significant but economically small. Given the difference between the 71% increase in units (solar home systems) and 25% increase in capacity (MW), it seems like most new adopters are buying very small systems (eg solar lanterns or pico PV), not household or industrial scale solutions. This implies a poverty constrained transition: people want off grid power but can only afford minimum capacity.

Barrier analysis: Financial and institutional hurdles dominate

The cancellation of electricity subsidies has heightened the interest in adopting renewable energy in Nigeria but many impediments still exist that hamper the development of the sector and constrain its prospect to play a major role in the country's energy transition. The results show that the main constraint for the full adoption of renewable energy technologies by households, enterprises and investors is financial and institutional barriers. These challenges not only slow the rate of adoption, but also the renewable energy industry's ability to meet the growing demand for affordable and reliable electricity (Akinyele *et al.*, 2020; Ohiare, 2022) ^[4, 17].

The study identified the high upfront cost of renewable energy technologies, particularly solar photovoltaic systems, as one of the key barriers. Although renewable energy can provide economic benefits in the long term through cheaper energy prices, the high upfront costs of purchasing and installing the necessary equipment make these technologies unaffordable for many homes and small businesses. Therefore, many consumers

who would like to switch to renewable energy are unable to do so because of economic constraints. This challenge is very relevant especially among low income households that have been hit hardest by rising electricity tariffs following subsidy removal (Adelabu, 2018) ^[2].

Scarce availability of affordable financing options makes the related issue of high installation costs worse. Availability of credit remains a big challenge for consumers and renewable energy developers: Financial institutions often consider renewable energy projects to be high-risk investments, which leads to strict borrowing criteria, high interest rates, and poor availability of long-term funding. The lack of specific financing schemes and credit facilities supported by the government is another hindrance to investment in renewable energy infrastructure and technology deployment (Olugbenga & Adepoju, 2021) ^[18].

Institutional and regulatory challenges also represent significant barriers to renewable energy development. Bureaucratic delays, complex licensing procedures, and regulatory uncertainties are frequent obstacles for investors and project developers, which increase project costs and discourage investment. The inconsistency of policy implementation and lack of clear long-term renewable energy strategies have resulted in uncertainty within the sector, which diminishes investor confidence and impedes the execution of projects. Such institutional weaknesses deter the efforts to attract both domestic and foreign investments into Nigeria's renewable energy market (Sovacool *et al.*, 2022) ^[21].

In addition, the lack of adequate infrastructure is a barrier to the growth of renewable energy systems in the country. Weak transmission networks, insufficient energy storage facilities and limited technical capacity limit the integration of renewable energy into the wider electricity system. While off-grid and mini-grid solutions offer alternatives to the national grid, infrastructure deficiencies remain a major obstacle for scaling up renewable energy deployment on a national level (Sambo, 2019) ^[19].

Another important barrier is the low level of public awareness and technical expertise of renewable energy technologies. Many consumers are not yet aware of the economic, environmental and operational benefits of renewable energy sources." This lack of awareness contributes to the reluctance to adopt new technology and reduces demand for renewable energy products and services. Also, the lack of experienced technicians and maintenance people affects the reliability and long-term viability of renewable energy projects, especially in rural areas.

Overall, the findings show that although the removal of power subsidies has improved market conditions for renewable energy adoption, financial and regulatory hurdles still dominate the sector. Overcoming these barriers through affordable financing options, regulatory reforms, infrastructure development, and public awareness campaigns will be vital for Nigeria's rapid uptake of renewable energy and successful transition to a sustainable energy future.

Table 4: Barriers to renewable adoption (by severity of impact)

Barrier	Specific constraint	Effect on adoption
High initial costs	Solar systems expensive for most households	Slows uptake
Limited access to finance	Lack of affordable loans/credit	Reduces investment capacity
Regulatory bottlenecks	Licensing delays, unclear approvals	Discourages private investors
Poor infrastructure	Weak grid, limited transmission	Restricts renewable integration
Low public awareness	Unfamiliarity with benefits	Lowers consumer acceptance

Source: Literature synthesis (Akinyele *et al.*, 2020; Ohiare, 2022) ^[4, 17] & interviews

Five obstacles are listed in Table 4. The first two factors – high upfront costs and a lack of funding avenues – are a direct consequence of the absence of supportive renewable financial legislation. There is consumer interest in investing but administrative delays are preventing that from happening because of regulatory hurdles. The fourth obstacle is inadequate infrastructure, which is a quintessential issue within the Nigerian power sector. However, it is significant to note that off-grid alternatives (mini grids, home systems) can circumvent grid deficiencies. This makes this obstacle more pertinent for grid-connected renewable energy sources. Limited awareness (fifth) is a subtler, more enduring limitation. A blank in the table means no protection against currency fluctuations and/or dependence on imports. Most of the solar components are imported and the naira depreciation after the removal of subsidies probably increases the real costs – an element that is not considered in the research.

Comparative analysis: What Nigeria can learn

As Nigeria navigates the challenges and opportunities of cutting electricity subsidies and transitioning to renewable energy, there are valuable lessons from the experiences of other developing and emerging economies. Comparative evidence shows that successful subsidy reform relies on the introduction of complementary policies beyond subsidy removal, such as supporting the uptake of renewable energy, attracting investment and helping consumers. Generally, countries that have implemented specific renewable energy incentives as part of subsidy reforms have fared better than countries that have eliminated subsidies without sufficient support mechanisms (Sovacool *et al.*, 2022) ^[21].

India is one of the most relevant examples for Nigeria. In response to reforms in the energy sector, the Indian government introduced the National Solar Mission, schemes for concessional financing, tax incentives and competitive procurement processes, to complement the reduction of

subsidies with significant investments in renewable energy development. These measures resulted in a big reduction in the cost of renewable technologies and a big increase in the amount of solar and wind energy capacity. Consequently India has emerged as one of the largest markets in the world for renewable energy. The Indian experience highlights the need to complement subsidy reforms with strong institutional support and financial incentives to encourage investment in renewable energy infrastructure for Nigeria (Chakravarty & Tavoni, 2021) ^[8].

Similarly, South Africa has achieved considerable private sector involvement in renewable energy through well-designed public-private partnerships and competitive procurement processes. The REIPPPP created a conducive investment climate that boosted investor confidence and allowed for the massive deployment of renewable energy. South Africa has much to teach Nigeria in terms of improving regulatory clarity, procurement procedures and investment-attractive policies to ensure local and international participation in the renewable energy industry.

Indonesia is another useful case study, especially how subsidy reforms are handled. Indonesia chose a gradual approach to cutting subsidies, instead of sudden cuts, giving consumers and businesses enough time to adapt to the changing energy prices. A gradualist approach lowered social resistance and reduced economic shocks, while providing incentives to renewable energy investments. The Indonesian case underlines the need to systematically plan reforms and apply transitional policies

that alleviate the burden of increasing energy costs on vulnerable populations (Bridle & Kitson, 2020) ^[7].

Egypt's experience, however, is a case in point of the possible dangers that come with removing subsidies without sufficient supporting systems. Subsidy reforms improved fiscal sustainability, but weak social protection programs increased energy poverty and public dissatisfaction. The sharp rise in energy prices has hit the poor the hardest, showing that subsidy regime reform without adequate welfare measures could pose substantial social and economic hurdles. This experience brings to the fore the need for Nigeria to embark on some measures such as lifeline tariffs, cash transfer programs and renewable energy subsidies to vulnerable groups to enable an inclusive energy transition (El-Katiri & Fattouh, 2017) ^[12]. The full assessment indicates that subsidy reform needs to be addressed in a comprehensive manner via a policy approach that involves market pricing combined with targeted government interventions. Learning from countries that have successfully embedded renewable energy incentives, conducive investment regulations, phased reform processes and social safety nets will help Nigeria accelerate the uptake of renewable energy and mitigate the negative impacts of subsidy removal. By absorbing these global experiences, Nigeria can develop strategies that improve energy security, promote economic sustainability, and promote inclusive development, all while moving towards a cleaner and more resilient energy future.

Table 5: International lessons – policy mix and outcomes

Country	Policy action	Outcome	Lesson for Nigeria
India	Subsidy reform + renewable incentives	Rapid solar/wind expansion	Incentives accelerate transition
South Africa	Renewable energy procurement (PPPs)	Increased private investment	PPPs improve outcomes
Indonesia	Gradual subsidy removal	Increased solar investment	Gradual reforms reduce shocks
Egypt	Subsidy removal without support	Rising energy poverty	Social protection is necessary

Source: Bridle & Kitson (2020) ^[7]; Chakravarty & Tavoni (2021) ^[8]; El-Katiri & Fattouh (2017) ^[12]; Sovacool *et al.* (2022) ^[21]

Table 5 provides four examples from around the world. India and South Africa show that success comes with the combination of subsidy reform and proactive renewables policies. It's Indonesia that shows gradual transitions help avoid societal upheaval. Egypt is a cautionary tale that pulling the plug on support systems exacerbates energy deprivation. The most relevant model for Nigeria is India, given comparable population size, informal economy and solar energy potential. India complemented subsidy cuts with a national solar plan, cheap loans through the Indian Renewable Energy Development Agency and competitive bidding processes. No agency or auction system of comparable stature exists in Nigeria.

Discussion of findings

Results of this study indicate that the removal of electricity subsidies in Nigeria has significantly altered electricity consumption patterns and created new incentives for renewable energy adoption. The results confirm theoretical assumptions

of energy transition and market liberalization that market based pricing mechanisms can influence consumer behaviour and stimulate investments in alternative energy technologies. According to the study, the increase in electricity tariffs has resulted in a decrease in the consumption of electricity from the grid and an increase in the search for renewable energy solutions.

One of the most important findings is perhaps that there is a well defined inverse relationship between electricity prices and electricity demand. The elimination of subsidies resulted in a sharp increase in electricity tariffs for all categories of consumers. The largest increase was for industrial consumers. Most consumers therefore reported that they were cutting back on electricity use in response to the increased costs. This result is consistent with economic theories of price elasticity of demand which argue consumers adjust consumption in the face of increasing prices. Adenikinju (2020) ^[3] reported similar results, stating that low electricity prices distort consumption behaviour and attenuate efficient energy use. Therefore, the

results of the present study showed that the withdrawal of subsidy has made Nigerian consumers to exhibit more rational electricity consumption behaviour.

The research further suggests that the increasing demand for renewable energy technologies has been driven by the increasing cost of electricity. Almost half of the survey respondents said they used alternative energy sources, particularly solar photovoltaic systems and mini-grids. This finding supports Sovacool (2021) ^[20] argument that reform of subsidies can improve the competitiveness of renewable energy by reducing price distortions in the energy market. International experiences in India and Indonesia also support the results, where subsidy reforms made way for consumers' adoption of renewable energy technologies and private entities to invest (Bridle & Kitson, 2020; Chakravarty & Tavoni, 2021) ^[7, 8]. The suggestion is that removing electricity subsidies may be a major trigger for Nigeria's energy transition in the long term.

This transition is further evidenced by the increase in renewable energy indicators. The increase in solar home systems, mini-grid projects and investments in renewable energy indicates that households, businesses and investors are responding positively to the opening of new opportunities in the renewable energy sector. However, the results indicate that the expansion of renewable energy in Nigeria is still relatively modest compared to the overall electricity demand of the country, despite these improvements. The relatively slow growth in installed solar photovoltaic capacity indicates that most consumers are using small-scale systems, mostly for basic household purposes rather than productive commercial or industrial applications. This view is supported by the finding of Akinyele *et al.* (2020) ^[4] that the implementation of renewable energy in Nigeria is still constrained by structural and financial limitations despite the country's large potential for renewable resources.

Another important finding concerns how consumers handled things after the subsidies were removed. The study shows many people are worried about the cost of energy and many of them are reducing their usage, delaying bill payments and looking for alternative energy sources. These responses show the ability of consumers to adapt but also the social costs of changing how subsidies work. The findings support Adelabu's (2018) ^[2] assertion that energy reforms poorly implemented may restrict access to adequate energy by vulnerable groups. The inequitable distribution of adjustment costs affects low-income households, among others, as they often lack the capital to invest in renewable energy options. So, getting rid of subsidies could make the economy work better, but it could also make social problems worse if you don't have the right support systems in place.

The study also says that the biggest problems with renewable energy have to do with money and institutions. Some of the reasons why the renewable energy sector is still not growing are high installation costs, hard to get affordable financing, regulatory problems, bad infrastructure and lack of public awareness. The findings concur with other studies that lack of funds and policy ambiguities are the major challenges facing

Nigeria in the area of renewable energy deployment (Ohiare, 2022; Olugbenga & Adepoju, 2021) ^[17, 18]. The removal of subsidies has made renewable energy technologies more attractive, but market incentives alone do not seem to be enough to drive wide adoption without further policy changes." The comparative analysis offers further insights into how Nigeria can maximize the gains from subsidy reform. Experiences in India, South Africa, Indonesia and Egypt show that successful subsidy reform is generally combined with targeted renewable energy incentives, supportive regulatory structures, and social protection measures. In particular, India's combination of subsidy reform with concessional financing, tax incentives and large-scale renewable energy programmes provides a practical model for Nigeria. In contrast, the Egyptian experience illustrates the risks of removing subsidies without adequate consumer protection mechanisms. These examples from abroad underline the need for a balanced policy approach combining economic efficiency with social protection and the promotion of renewable energy.

The findings indicate that the removal of electricity subsidy has created opportunities and challenges for Nigeria's energy sector. Higher tariffs have stimulated energy efficiency and created greater interest in renewable energy technologies, but large financial, institutional and social barriers continue to impede the pace of transition. The study therefore lends support to the view that subsidy reform should not be viewed as an isolated policy measure, but as part of a broader energy transition strategy. A significant increase in the use of renewable energy will require subsidy reforms to be complemented by affordable financing programmes, regulatory improvements, infrastructure investments and targeted support for vulnerable consumers. Such an integrated approach would allow Nigeria to achieve greater energy security, promote sustainable development, and accelerate progress toward a cleaner and more resilient energy future.

Conclusion

This study was on the effect of the removal of electricity subsidies on the adoption of renewable energy in Nigeria. The study revealed that the policy has a great effect on the trend of electricity consumption, the cost of energy, and consumer behaviour. The results show a clear inverse relationship between electricity prices and demand, with many homes and businesses cutting back on energy use and adopting conservation measures when prices are high. At the same time, the removal of subsidies has made renewable energy technologies – particularly solar home systems and mini-grid solutions – more comparatively attractive, spurring greater interest and investment in alternative energy sources. These developments indicate that subsidy reform can be an important trigger of Nigeria's energy transition, if accompanied by appropriate policy measures.

Although the adoption of renewable energy is growing favourably, the research finds that the pace of transition is hampered by multiple financial and institutional barriers. High installation costs, lack of access to affordable financing, regulatory barriers, inadequate infrastructure and a lack of

public awareness continue to hamper the widespread deployment of renewable energy technologies. In addition, the rising costs of electricity are not being passed on to low income families equally, many of whom cannot afford any alternative energy sources. Thus, although the removal of subsidies has provided market incentives for renewable energy development, it has also raised concerns about energy affordability and the potential for energy poverty among vulnerable communities.

The research ultimately concludes that electricity subsidy removal alone is insufficient to achieve a sustainable and inclusive energy transition in Nigeria. To fully reap the benefits of reform, government policies need to be complemented by targeted incentives for renewable energy sources, financing options, regulatory improvements, infrastructure, and social safety nets to protect vulnerable consumers. "Borrowing from global best practices, Nigeria can turn its energy space around and create an enabling environment for renewable energy investments while protecting the interests of consumers. If these additional measures are successfully implemented, the country will be able to strengthen energy security, reduce dependence on conventional energy sources and accelerate progress in sustainable economic growth and ecological sustainability.

Policy recommendations

Set up financing programmes for renewable energy: The Federal Government should launch low-interest loan programmes, credit guarantees and green financing facilities through commercial banks and development finance institutions to make renewable energy technologies affordable for businesses and homes. Such financing methods would help people afford the high cost of installation upfront and speed up the use of renewable energy.

Provide concrete rewards for using renewable energy. The government should provide financial incentives such as tax incentives, duty-free imports of renewable energy equipment, investment tax credits & financial assistance for solar photovoltaic systems. Such incentives would involve the private sector and would get people to invest in renewable energy infrastructure." A stable and predictable regulatory environment will enhance investor confidence and support the development of renewable energy projects.

Mini-grids and off-grid solutions could expand access to electricity to more rural areas. The government should target the installation of solar mini-grids and stand-alone systems in rural and underserved areas where extending the power grid would be prohibitively expensive. This would make electricity more accessible, reduce energy poverty and create a stronger economy for everyone. Targeted support should be provided for low income households through programmes such as lifeline tariffs, energy vouchers and conditional cash transfers to help alleviate the negative impacts of increasing electricity tariffs.

Raise public awareness and build technical capacity: Large-scale awareness campaigns should be conducted to inform consumers of the economic and environmental benefits of

renewable energy technologies. Also, vocational training programmes should be developed to build the technical skills needed for installation, operation and maintenance of renewable energy systems. Government should provide an enabling environment for the public-private partnership to mobilise domestic and foreign investment in the renewable energy projects. Partnerships between government agencies, private investors, development partners and local communities can help speed up infrastructure development and support Nigeria's transition to a sustainable and resilient energy system.

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