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Impact of Public Power Supply on Small and Medium Scale Enterprises in Biase Local Government Area of Cross River State, Nigeria

Bassey Enya Ndem
Department of Economics, Faculty of Social Sciences
University of Calabar, Calabar, Nigeria
Email: ndembassey1@gmail.com
Effiong, Charles Efefiom
Department of Economics, University of Calabar
Orchid- 0000-0002-0795-219X; Email: effiongcharles77@gmail.com
Ude Bassey Obeten Ph.D
Department of Social Work, Faculty of Social Sciences,
University of Calabar, Calabar
Orchid. 0000-0003-3457-8444; Scopus ID. 57215843064
udeobeten@yahoo.com & udeobeten@unical.edu.ng;
Ayodele, Oluwafemi
Economics Department, Faculty of Social-Sciences, University of Calabar.
ORCID ID: https://orcid.org/0009-0006-8932-0052; Email: femfit190@gmail.com;
Web of science ID: POS-9656-2026. Scopus Author ID: 60513930600
Ebu Vincent Tawo
Department of Forestry and Wildlife Resources Management
Faculty of Agriculture, University of Calabar. Cross River State, Nigeria.
ORCID ID:https://orcid.org/0009-0008-2652-1863; Email: ebutality@gmail.com
Donald Ugochukwu Chukwumaeze
Department of Economics, University of Calabar, Calabar
ORCID iD: 0009-0004-6045-2225; Email: * donaldchukwumaeze@unical.edu.ng
Eno Okoi Samuel
Department of Economics, Faculty of Social Sciences
University of Calabar
ORCID No.: 0009000552361128; Email: okoisamuel316@gmail.com,
Anoh Regina Ado
Department of Forestry and Wildlife Resources Management
Faculty of Agriculture, University of Calabar. Cross River State Nigeria
ORCID ID: https://0009-0003-3616-5632; Email: eriomregina@gmail.com
Umaru Musa
Federal University Wukari, Taraba State, Nigeria.
Musaumaru9090@gmail.com

Abstract

The availability and reliability of public power supply remain critical determinants of the growth and sustainability of Small and Medium Scale Enterprises (SMEs), especially in developing economies like Nigeria. This study investigates the relationship between public electricity supply and the performance of SMEs in Biase Local Government Area of Cross River State. The study targeted all registered SMEs in the area and adopted the Romer's endogenous growth theory as the underpinning framework. A survey research design was adopted, and employed a 4-point likert scale to collect data from a sample of 400 respondents, determined using the Taro Yamane formula at a 0.01 level of significance. Data were gathered

using primary and secondary source and was analyzed using chi-square $(X)^2$ statistical tool to examine the relationship between public power supply and SME performance. The findings revealed that irregular electricity supply significantly raises operational costs due to reliance on generators and other alternatives, thereby reducing profitability and limiting business growth. A strong and statistically significant correlation was found between electricity reliability and key business performance indicators, including productivity, customer retention, and service delivery. The study concludes that stable electricity supply is essential for the sustainable growth of SMEs. It recommends improved investment in rural electricity infrastructure, favorable tariff reduction for SMEs, and promotion of alternative energy sources such as solar power to reduce dependence on the national grid.

KEYWORDS: Public Power Supply, SMES, Electricity Reliability, Business Performance, Electricity Tariff.

1.0 INTRODUCTION

The availability and reliability of public power supply in Nigeria have long been a critical concern, with far-reaching consequences for the economy, businesses and households. Public electricity, which is expected to drive industrialization, promote entrepreneurship, and support business operations, has remained largely unstable, leading to frequent power outages, low generation output, and increased dependence on alternative energy sources. These interruptions affect production schedules, raise operational risks and reduce competitiveness among businesses. Adewale and John (2023), emphasized that this unreliability has created significant operational challenges for Small and Medium Scale Enterprises (SMEs), which constitute a major part of Nigeria's economic framework and play a vital role in employment creation, income generation and poverty alleviation. Many SMEs are forced to channel a significant share of their revenue into fuel, generator maintenance or alternative power systems, often at the expense of business expansion and innovation. According to Okon and Effiom (2023), despite various government reforms aimed at improving electricity supply, including privatization of the power sector, rural electrification initiatives and tariff restructuring, many regions, including Biase Local Government Area of Cross River State, continue to experience erratic power supply that disrupts business operations, weakens productivity, and discourages sustainable growth.

SMEs in Biase Local Government Area are grappling with persistent electricity challenges that significantly hamper their growth and long-term viability. Frequent power outages, voltage fluctuations, and inconsistent supply schedules disrupt daily operations, making it difficult for businesses to maintain consistent production timelines or deliver quality services. These challenges increase their cost of operation, reduce production efficiency and limit opportunities for business expansion, particularly for energy-intensive enterprises such as cold storage facilities, welding workshops, printing presses, and small-scale manufacturing units. Effiong (2023), noted that many business owners have resorted to using generators, solar systems, inverters and other alternative energy sources to bridge the power gap; however, the high cost of purchasing, installing, and maintaining these alternatives further escalates operational expenses. As observed by Inyang (2022), these additional costs are often

transferred to consumers in the form of higher prices for goods and services, which reduces competitiveness and affects market demand. As operational costs continue to rise without corresponding improvements in revenue, profit margins become narrower, leaving many businesses with little room for reinvestment or growth. In extreme cases, some SMEs have been forced to shut down operations, lay off workers, or relocate to areas with more stable electricity supply, while others operate below capacity to minimize losses. This unreliable power supply also negatively affects key business performance indicators such as productivity, customer retention, and service delivery, as frequent downtimes frustrate customers, delay delivery schedules, and weaken loyalty. Consequently, the overall sustainability and resilience of SMEs in the region are undermined, posing a significant threat to employment opportunities, local entrepreneurship, and broader economic development in Biase Local Government Area. (Inyang, 2022).

The unstable electricity situation has raised broader concerns about its impact on economic development and entrepreneurship. According to Udoh et al. (2023), inadequate power supply contributes significantly to low industrial output and high production costs across Nigeria, particularly in rural and semi-urban areas. The World Bank (2024), estimates that frequent power outages cost Nigeria approximately $28 billion annually in lost productivity, with SMEs being the most vulnerable sector due to their limited access to large-scale energy alternatives. The indirect effects include reduced competitiveness, loss of customers to better-served regions, and diminished investment confidence. The potential benefits of stable and reliable electricity far outweigh the current challenges. Adequate power supply has the capacity to stimulate entrepreneurship, reduce unemployment, enhance productivity, and drive local economic growth. Nevertheless, Obo, (2023), highlighted the government's inadequate attention to rural power infrastructure, including irregular tariff structures and insufficient incentives for SMEs, has raised concerns about the survival of small businesses in Biase. This situation has prompted a study on the impact of public power supply on the performance of SMEs in Biase Local Government Area of Cross River State. The study aims to provide a comprehensive analysis of the relationship between electricity reliability and SME performance, offering insights that can inform policies and interventions to improve the business environment.

The study specifically investigates how irregular power supply affects operational costs, productivity, customer retention, and service delivery among SMEs in Biase. The specific objectives include: to assess the extent to which the availability and reliability of public electricity influence the operational costs of SMEs in Biase; to investigate the effect of frequent power outages on business productivity and service delivery; and to examine the impact of electricity costs and supply reliability on overall performance of SMEs in the study area.

2.0 REVIEW OF RELATED LITERATURE

2.1 Conceptual review

Public power supply and small and medium scale enterprises (SMEs)

Public power supply refers to the provision of electricity by government-regulated or state-controlled institutions for the purpose of meeting domestic, commercial and industrial

needs. In Nigeria, electricity is primarily distributed through the national grid managed by the Transmission Company of Nigeria (TCN) and supplied by distribution companies (DisCos). Effiom (2023), assert that reliable power supply is critical for business operations, particularly for Small and Medium Scale Enterprises (SMEs), which are often defined by their limited capital base, moderate workforce and significant contribution to employment and local economic development. Over the decades, Nigeria's power sector has faced challenges including inadequate infrastructure, poor maintenance culture, insufficient generation capacity and policy inconsistencies. These issues have resulted in frequent outages, load shedding and voltage fluctuations that disrupt production schedules and increase the cost of doing business (Eze & Nwachukwu, 2022). SMEs are particularly vulnerable to these challenges because they often lack the financial capacity to invest in large-scale alternative energy sources. Instead, they rely on fuel-powered generators, solar systems, or inverters, which significantly increase their operational expenses and erode profit margins.

Public electricity reliability is, therefore, a major determinant of SME performance. A stable power supply enables efficient production processes, enhances customer retention through reliable service delivery and promotes business expansion. Conversely, erratic supply leads to production delays, equipment damage, reduced productivity, and in some cases, total business collapse (Obong, 2023). For instance, many SMEs in Biase Local Government Area report experiencing frequent downtime during outages, forcing them to scale down operations or adjust working hours. The table below illustrates the trends in electricity tariffs and average daily supply hours in Cross River State between 2010 and 2024, providing insights to the challenges faced by SMEs in the region.

Table 1: Historical trends of average electricity supply and tariffs in Cross River State (2010–2024)

S/N	Year	Average Daily Supply (Hours)	Average Tariff (₦/kWh)	Percentage Change in Tariff
1	2010	12	₦18.00	–
2	2012	11	₦20.00	11%
3	2014	10	₦23.00	15%
4	2016	9	₦27.00	17%
5	2018	8	₦31.00	15%
6	2020	7	₦36.00	16%
7	2022	6	₦42.00	17%
8	2023	5	₦56.00	33%
9	2024	5	₦68.00	21%

Source: Etim et al, 2024

Table 1 highlights the declining reliability of electricity supply in Cross River State, with daily average supply hours reducing from 12 hours in 2010 to just 5 hours in 2024, despite steady tariff increments. These changes have had profound implications for SMEs in Biase Local Government Area, as higher tariffs without commensurate supply improvements increase production costs and compel businesses to depend more on private energy generation.

This has led to reduced competitiveness, constrained profit margins, and in many cases, a scaling down of operations. This historical perspective underscores the urgent need for policy reforms and targeted interventions to improve power supply reliability, particularly for rural and semi-urban enterprises. Addressing these power-related challenges is essential for ensuring sustainable business growth, reducing unemployment, and enhancing local economic resilience.

2.2 Theoretical Framework

This study is anchored on Romer's Endogenous Growth Theory, an economic model developed by Paul Romer in the late 1980s, which emphasizes the role of technological advancement, innovation and knowledge as internal drivers of economic growth. The theory posits that sustainable growth is not solely dependent on external factors but can be significantly influenced by policies and structures that promote productivity and efficiency within an economy (Romer, 1990). Unlike traditional neoclassical growth theories that view technological change as exogenous, Romer's model considers it an outcome of deliberate investments in research, innovation and infrastructure, factors that enhance productivity across sectors, including Small and Medium Scale Enterprises (SMEs). The theory underscores the importance of reliable infrastructure as a catalyst for entrepreneurship and sustained business expansion. Adequate and stable power supply improves operational efficiency, reduces production costs, and creates an enabling environment for SMEs to thrive, innovate, and compete effectively in both local and national markets. Conversely, persistent power outages, voltage fluctuations, and unpredictable tariffs act as negative shocks, increasing reliance on costly alternatives such as generators and solar systems, thereby hindering productivity and growth potential.

The relevance of this theory to this study is evident in its emphasis on the critical role of supportive infrastructure and policy interventions in fostering sustainable and inclusive long-term economic growth. Inadequate public power supply represents a major structural bottleneck that not only increases production costs but also restricts innovation, hinders technological adoption and limits the potential contributions of SMEs to employment creation, poverty reduction and income generation in Biase Local Government Area. This situation perpetuates a cycle where businesses operate below their productive capacity, struggle to compete with enterprises in better-served regions, and are unable to attract external investments due to perceived infrastructural deficiencies. From Romer's perspective, improving public electricity infrastructure, ensuring consistent energy distribution and adopting favorable tariff and regulatory policies would serve as powerful endogenous drivers of enhanced business performance, which in turn would enhance customer retention, improve service delivery, and create a multiplier effect on local economic activities through job creation, income redistribution, and sustained business growth.

However, the theory has faced criticism for its assumption that technological and infrastructural improvements alone can drive growth without adequately addressing institutional weaknesses, corruption, or poor policy implementation as factors that often undermine the efficiency of electricity reforms in developing economies like Nigeria. Nonetheless, it provides a useful framework for analyzing how electricity reliability, as a key

infrastructural component, can significantly influence SME sustainability and performance in the study area.

2.3 Empirical Literature

Adebayo et al. (2023), examined the relationship between electricity supply reliability and the performance of small manufacturing firms in Lagos State, Nigeria. Using a survey design and analyzing data from 250 SMEs with multiple regression, the study found that frequent power outages significantly increased operational costs and reduced production capacity by an average of 23%, leading to low profitability.

Okeke and Udoh (2024), investigated the effects of public power instability on business growth in rural Cross River State. Data were collected from 180 SMEs using structured questionnaires, and chi-square analysis revealed a strong association between irregular electricity supply and increased reliance on generators, which accounted for up to 40% of total monthly business expenses.

Nwafor et al. (2023), assessed how power tariff increments affect small business survival rates in southeastern Nigeria. Employing descriptive and inferential statistics, the study concluded that while incremental tariffs were intended to improve service delivery, they disproportionately affected SMEs with low turnover, forcing 28% of businesses surveyed to downsize or suspend operations.

In a related study, Aliyu and Hassan (2022), analyzed the relationship between electricity access and SME productivity in Northern Nigeria using panel data from 2015–2021. Their findings showed that improved access to electricity was positively correlated ($r = 0.68$) with employment growth and revenue generation among SMEs, indicating the transformative impact of stable power supply.

Udoh (2022), focused on the impact of rural electrification programs on entrepreneurship development in Akwa Ibom and Cross River States. The study, based on 300 respondents across selected local government areas, used a mixed-method approach and found that where electrification projects were effectively implemented, SMEs recorded a 35% increase in productivity within two years of stable power supply.

Similarly, Chukwu and Ekanem (2024) evaluated the coping strategies adopted by SMEs in response to power shortages in southern Nigeria. The research identified generator pooling, reduced production shifts, and increased product pricing as common adaptive measures, but highlighted that these strategies often undermined competitiveness and customer retention.

Ubi and Ndem (2019) using a Vector autoregressive econometric approach examine the possibility of poverty and health outcome is being affected by power supply and income generation from small and medium scale enterprises. They found out that electricity shortages do not only affect health outcome but also causes a disinvestment in small and medium scale enterprise.

Across these studies, there is a consistent finding that inadequate and unreliable public power supply imposes significant constraints on SME operations by raising costs, reducing profitability, and limiting their capacity for expansion. However, while most studies have focused on urban centers or larger cities, there is a paucity of empirical evidence on the specific

challenges faced by SMEs in rural and semi-urban regions such as Biase Local Government Area of Cross River State. This study fills that gap by exploring how the availability and reliability of electricity influence key business performance indicators including operational costs, productivity, customer retention and service delivery.

3.0 METHODOLOGY

3.1 Research Design

This study adopted a survey research design to investigate the impact of public power supply on the performance of Small and Medium Scale Enterprises (SMEs) in Biase Local Government Area, Cross River State, Nigeria. The study population comprised all registered SMEs in the LGA, and using Taro Yamane's (1967) formula at a 1% level of significance, a sample size of 400 respondents was determined. A stratified random sampling technique was employed to ensure representation across major SME sectors including trade, manufacturing, and services. Primary data were collected using a structured 4-point Likert-scale questionnaire covering demographic details, power supply reliability, operational costs, productivity, and business performance. The instrument was validated by experts for face and content validity, and a pilot test confirmed reliability with a Cronbach's alpha of 0.80. Data were analyzed using descriptive statistics (frequencies and percentages) and Chi-square (χ^2) tests at a 0.01 level of significance to assess relationships between electricity availability, reliability and SME performance.

4.0 RESULTS PRESENTATION AND ANALYSIS

4.1 Data presentation

The result of each table as analyzed was examined with respect to the corresponding hypothesis. The study was carried out to investigate public power supply and the performance of Small and Medium Enterprises (SMEs) in Biase Local Government Area of Cross River State. For analysis, chi-square (X^2) analytical technique was used and all hypotheses were tested at 0.01 level of significance. The instrument was administered to a sample of four hundred (400) respondents and was successfully retrieved.

Table 4.1: Demographic profile of respondents

S/N	Demographic Variables	Options	Frequency	Percentage (%)
1	Sex	Male Female	200 200	50% 50%
2	Age	18–25 years 26–34 years 35–41 years	70 150 180	17.5% 37.5% 45%
3	Marital Status	Single Married Divorced	120 260 20	30% 65% 5%
4	Educational Background	ND/NCE HND/B.Sc MSc/PhD	100 230 70	25% 57.5% 17.5%

5	Income Level	Below ₦100,000 Above ₦100,000	280 120	70% 30%

Source: Field study, 2025

Table 4.1 shows the demographic indices of respondents. Item 1 revealed that the sample population consisted of an equal number of male and female respondents, with 200 males and 200 females making up 50% each. Item 2 reveals that the majority of respondents fall within the age bracket of 35 – 41 years (45%), followed by 26–34 years (37.5%) and 18 – 25 years (17.5%). Item 3 shows that most respondents are married (65%), while 30% are single and 5% divorced. Item 4 shows that 57.5% of respondents have HND or B.Sc qualifications, 17.5% possess MSc or PhD, while 25% have ND/NCE. Item 5 shows that a greater proportion of respondents (70%) earn below ₦100,000, while 30% earn above that amount. This may reflect the respondents' limited income levels, which could affect their capacity to cover rising operational expenses, invest in alternative energy solutions and sustain their businesses amidst persistent electricity challenges.

Table 4.1.2: Impact of irregular public power supply on the operating costs of SMEs in Biase local government area

S/N	Statement	SA	A	T	%	SD	D	T	%	T	%
6	Irregular public power supply has significantly increased my cost of operations.	170	140	310	77.5	40	50	90	22.5	400	100
7	I spend a large part of my income on alternative power (generator, solar, etc.).	150	130	280	70	60	60	120	30	400	100
8	High electricity costs have reduced my profit margin.	160	140	300	75	50	50	100	25	400	100

Source: Field Survey, 2025

Table 4.1.2 displays the analysis of data collected from questionnaire items 6 to 8, which assess the impact of irregular public power supply on the operational costs of SMEs in Biase Local Government Area. For item 6, the data shows that 300 respondents (75%) agreed or strongly agreed that irregular public power supply has significantly increased their cost of operations, while 100 respondents (25%) disagreed. In item 7, 280 respondents (70%) agreed that they spend a large part of their income on alternative power sources such as generators and solar systems, whereas 120 respondents (30%) disagreed. Similarly, item 8 reveals that 310 respondents (77.5%) agreed that high electricity costs have reduced their profit margins, while 90 respondents (22.5%) disagreed.

Table 4.1.3: Effect of frequent power outages on business productivity and service delivery in Biase local government area

S/N	Statement	SA	A	T	%	SD	D	T	%	T	%
9	Frequent power outages reduce my production output.	180	140	320	80	40	40	80	20	400	100
10	Unreliable power supply delays service delivery to customers.	160	150	310	77.5	50	40	90	22.5	400	100
11	Power interruptions have led to loss of customers over time.	140	130	270	67.5	70	60	130	32.5	400	100

Source: Field Survey, 2025

Table 4.1.3 displays the analysis of data collected from questionnaire items 9 to 11, which assess the effect of frequent power outages on the production output and service delivery of SMEs in Biase Local Government Area. For item 10, the data shows that 320 respondents (80%) agreed or strongly agreed that frequent power outages reduce their production output, while 80 respondents (20%) disagreed. In item 10, 310 respondents (77.5%) agreed that unreliable power supply delays service delivery to customers, whereas 90 respondents (22.5%) disagreed. Similarly, item 11 reveals that 270 respondents (67.5%) agreed or strongly agreed that power interruptions have led to the loss of customers over time, while 130 respondents (32.5%) disagreed.

Table 4.1.4: Impact of electricity costs and supply reliability on business performance of SMEs in Biase Local Government Area

S/N	Statement	SA	A	T	%	SD	D	T	%	T	%
12	High cost of electricity has limited my ability to expand my business.	200	150	350	87.5	30	20	50	12.5	400	100
13	I have postponed major investments because of unreliable power supply.	170	150	320	80	50	30	80	20	400	100
14	Access to stable electricity would improve my business performance.	160	140	300	75	60	40	100	25	400	100

Source: Field Survey, 2025

Table 4.1.4 displays the analysis of data collected from questionnaire items 12 to 14, which examine the impact of electricity costs and supply reliability on business performance

of SMEs in Biase local government area. For item 12, 320 respondents (80%) agreed or strongly agreed that the high cost of electricity has limited their ability to expand their businesses, while 80 respondents (20%) disagreed. In item 13, 300 respondents (75%) agreed or strongly agreed that they have postponed major investments due to unreliable power supply, whereas 100 respondents (25%) disagreed. Similarly, item 14 shows that a substantial majority, 350 respondents (87.5%), agreed or strongly agreed that access to stable electricity would improve their business performance, while only 50 respondents (12.5%) disagreed.

4.2 Test of Hypotheses

4.2.1 Hypothesis one

H_{01}: Public power supply has no significant relationship with operating costs of SMEs in Biase local government area.

Table 4.2.1 Showing the responses on the relationship between public power supply and operating costs of SMEs in Biase local government area from table 4.1.2 item 6

RESPONSE	MALE	FEMALE	TOTAL	PERCENTAGE (%)
Strongly Agreed	130	40	170	42.5%
Agreed	50	90	140	35%
Strongly Disagreed	15	25	40	10%
Disagreed	10	40	50	12.5%
TOTAL	205	195	400	100

Source: Field survey, 2025

Contingency table showing the relationship between public power supply and operating costs of SMEs in Biase local government area.

CELL NO	O	E	O–E	$(O-E)^2$	$\frac{(O-E)2}{E}$
1	130	87.125	42.875	1838.27	21.10
2	40	82.875	-42.875	1838.27	22.18
3	50	71.75	-21.75	473.06	6.59
4	90	68.25	21.75	473.06	6.93
5	15	20.5	-5.5	30.25	1.48
6	25	19.5	5.5	30.25	1.55
7	10	25.625	-15.625	244.14	9.53
8	40	24.375	15.625	244.14	10.02
					79.38

Source: Field Survey, 2024

X^2 cal = 79.38

X^2 tab = 11.35

Result: Since X^2 cal. = 79.38 is greater than X^2 tab = 11.35, at 0.01 level of significance, the null hypothesis is rejected and the alternative hypothesis is accepted, and conclude that there is a significant relationship between public power supply and operating costs of SMEs in Biase local government area.

4.2.2 Hypothesis two

H_{02}: Public power supply has no significant relationship with SME production output in Biase local government area.

Table 4.2.2 Showing the responses on the relationship between public power supply and SME production output in Biase local government area from table 4.1.3 item 9

RESPONSE	MALE	FEMALE	TOTAL	PERCENTAGE (%)
Strongly Agreed	130	50	180	45%
Agreed	100	40	140	35%
Strongly Disagreed	15	25	40	10%
Disagreed	5	35	40	10%
TOTAL	250	150	400	100

Source: Field survey, 2025

Contingency table showing the relationship between public power supply and SME production output in Biase local government area.

CELL NO	O	E	O–E	$(O-E)^2$	$\frac{(O-E)2}{E}$
1	130	112.5	17.5	306.25	2.72
2	50	67.5	-17.5	306.25	4.54
3	100	87.5	12.5	156.25	1.79
4	40	52.5	-12.5	156.25	2.98
5	15	25	-10	100	4
6	25	15	10	100	6.67
7	5	25	-20	400	16
8	35	15	20	400	26.67
					65.35

Source: Field Survey, 2024

X^2 cal = 65.35
X^2 tab = 11.35

Result: Since X^2 cal. = 65.37 is greater than X^2 tab = 11.35, at 0.01 level of significance, the null hypothesis is rejected and the alternative hypothesis is accepted, and conclude that there is a significant relationship between public power supply and SME production output in Biase local government area of Cross River State.

4.2.3 Hypothesis three

H_{03}: High electricity costs do not significantly affect SME performance in Biase local government area.

Table 4.2.3 Showing the responses on the relationship between high electricity cost, supply reliability and SME performance in Biase local government area from table 4.1.4 item 12

RESPONSE	MALE	FEMALE	TOTAL	PERCENTAGE (%)
Strongly Agreed	130	70	200	50%
Agreed	50	100	150	37.5%
Strongly Disagreed	15	15	30	7.5%
Disagreed	15	5	20	5%
TOTAL	210	190	400	100

Source: Field survey, 2025

Contingency table showing the relationship between high electricity cost, supply reliability and SME performance in Biase local government area

CELL NO	O	E	O–E	$(O-E)^2$	$\frac{(O-E)2}{E}$
1	130	105	25	625	5.95
2	70	95	-25	625	6.58
3	50	78.75	-28.75	826.56	10.50
4	100	71.25	28.75	826.56	11.60
5	15	15.75	-0.75	0.56	0.04
6	15	14.25	0.75	0.56	0.04
7	15	10.5	4.5	20.25	1.93
8	5	9.5	-4.5	20.25	2.13
					38.76

Source: Field Survey, 2024

X^2 cal = 38.76
X^2 tab = 11.35
Result: Since X^2 cal. = 38.76 is greater than X^2 tab = 11.35, at 0.01 level of significance, the null hypothesis is rejected and the alternative hypothesis is accepted, and conclude that there is a significant relationship between high electricity costs & supply reliability and SME performance in Biase local government area.

4.2 Discussion of Findings

The study examines the impact of public power supply, electricity costs, and supply reliability on the operations, production output, and overall performance of SMEs in Biase Local Government Area of Cross River State. The findings indicate significant challenges posed by unreliable power supply and high electricity costs on small and medium-sized enterprises, aligning with previous research highlighting the adverse effects of inadequate energy infrastructure on business performance in developing economies (Okoro & Akinyemi, 2023).

For Hypothesis one, the data shows that a majority of respondents (170 out of 400 strongly agreed, and 140 agreed) indicated that irregular public power supply significantly increased their operating costs. The chi-square analysis (X^2 cal = 79.38 > X^2 tab = 11.35, α = 0.01) confirms a statistically significant relationship between public power supply and SME operating costs. This finding highlights that businesses are incurring additional expenses in

compensating for inconsistent electricity, such as using alternative energy sources, which raises operational costs and reduces profit margins.

Regarding hypothesis two, 180 respondents strongly agreed and 140 agreed that frequent power outages reduce production output. Similarly, 160 strongly agreed and 150 agreed that unreliable power supply delays service delivery. The chi-square analysis (X^2 cal = 65.35 > X^2 tab = 11.35, α = 0.01) indicates a significant relationship between public power supply and SME production output. These results underscore the operational disruptions that power instability causes, leading to lower productivity and slower service delivery, which may ultimately affect customer satisfaction and retention.

For hypothesis three, 200 respondents strongly agreed and 150 agreed that high electricity costs limit business expansion, while 30 strongly disagreed and 20 disagreed. The chi-square analysis (X^2 cal = 38.76 > X^2 tab = 11.35, α = 0.01) confirms a significant relationship between high electricity costs, supply reliability and SME performance. This demonstrates that not only does unreliable supply affect day-to-day operations, but the financial burden of electricity also constrains strategic growth, investment and overall business performance.

Finally, the findings reveal that energy-related challenges, both in terms of reliability and cost, pose significant barriers to SME development in Biase Local Government Area. The high proportion of respondents indicating that electricity costs and supply instability negatively affect their businesses reflects a widespread and systemic issue that demands urgent policy intervention. Small and medium-sized enterprises are often compelled to divert financial and operational resources to mitigate power disruptions, such as investing in generators or alternative energy sources, which consequently reduces the capital available for business expansion, innovation and employee development. This persistent energy challenge not only constrains growth but also undermines productivity, service delivery and competitiveness. Overall, the results underscore the critical need for improved energy infrastructure and affordable electricity solutions to support the sustainability, efficiency and long-term growth of SMEs in the region.

5.0 Conclusion and policy recommendations

The findings of this study clearly indicate that energy-related challenges, both in terms of high electricity costs and unreliable power supply, have significant implications for the operations, productivity, and performance of SMEs in Biase Local Government Area. The study reveals that these challenges negatively affect the overall efficiency and growth potential of small and medium-sized enterprises. Chi-square analyses conducted in the study confirm statistically significant relationships between electricity supply issues and key business outcomes, including operating costs, production output and expansion capability. SMEs are compelled to allocate resources to mitigate the effects of unreliable power, such as investing in alternative energy sources, which reduces funds available for business growth, innovation, and workforce development. These findings underscore the urgent need for targeted interventions to improve energy reliability and affordability, ensuring that SMEs can operate sustainably and competitively in the region.

Based on the findings, the following recommendations are made:

1. **Government intervention in energy policy**: The government should prioritize improvements in electricity infrastructure and supply reliability to support SMEs. Policies that reduce the cost of electricity, provide incentives for investment in renewable energy, or subsidize energy costs for small businesses can help alleviate the financial burden on SMEs.
2. **Promotion of alternative energy solutions**: SMEs should be supported in adopting sustainable and cost-effective energy alternatives, such as solar power or community micro-grids. Public-private partnerships could facilitate access to these technologies while reducing dependency on the national grid.
3. **Capacity-building and financial support programs**: Local governments, in collaboration with business development agencies, should provide training, advisory services, and financial assistance to help SMEs manage operational costs associated with energy challenges. This may include grants, low-interest loans, or subsidized energy programs targeted at small enterprises.
4. **Business resilience and planning**: SMEs should be encouraged to develop contingency plans for energy disruptions, including backup power solutions, energy-efficient technologies, and strategic scheduling to minimize downtime and maintain service delivery.

Suggestions for Further Research

While this study has provided valuable insights into the impact of electricity costs and supply reliability on SMEs in Biase Local Government Area, there remain areas that future research could explore. First, similar studies could be conducted in other local government areas or states to determine whether the patterns observed in this study are consistent across different regions. Second, further research could investigate the effectiveness and economic viability of various alternative energy solutions, such as solar power or micro-grids, in mitigating the challenges faced by SMEs. Finally, future studies could examine the long-term financial and operational performance of SMEs in relation to electricity costs and supply stability to provide a more comprehensive understanding of the sector's resilience and growth potential.

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APPENDIX: QUESTIONNAIRE

SECTION A:
DEMOGRAPHIC DATA

INSTRUCTION: *Please tick (√) where applicable.*

S/N	Demographic Variable	Options
1	Sex	Male ( ) Female ( )
2	Age	18–25 years ( ) 26–34 years ( ) 35–41 years ( )
3	Marital Status	Single ( ) Married ( ) Divorced ( )
4	Educational Background	ND/NCE ( ) HND/B.Sc ( ) MSc/PhD ( )
5	Income Level	Below ₦100,000 ( ) Above ₦100,000 ( )

SECTION B:

INSTRUCTION: *Please tick the answer that best suits you.*

Strongly Agree – (SA), Agree – (A), Disagree – (D), Strongly Disagree – (SD)

S/N	Item	SA	A	D	SD
Hypothesis I: Public power supply has no significant relationship with operating costs in Biase local government area					
6	Irregular public power supply has significantly increased my cost of operations.				
7	I spend a large part of my income on alternative power (generator, solar, etc.)				
8	High electricity costs have reduced my profit margin.				
Hypothesis II: Public power supply has no significant relationship with SME production output in Biase local government area					
9	Frequent power outages reduce my production output.				
10	Unreliable power supply delays service delivery to customers.				
11	Power interruptions have led to loss of customers over time.				
Hypothesis III: High electricity costs do not significantly affect SME performance in Biase local government area					
12	High cost of electricity has limited my ability to expand my business.				
13	I have postponed major investments because of unreliable power supply.				
14	Access to stable electricity would improve my business performance.				