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ENERGY INFRASTRUCTURE FINANCING STRUCTURES IN NIGERIA

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CERTIFICATION PAGE

This report is certified as an original research work conducted by African Energy Research (AER) in accordance with approved research standards, methodologies, and ethical guidelines.

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DECLARATION

This research report has not been submitted to any other institution for any purpose and all sources of data and references have been duly acknowledged.



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LIST OF ACRONYMS

AfDB	African Development Bank
ATI	African Trade Insurance Agency
ATC&C	Aggregate Technical, Commercial and Collection
BOI	Bank of Industry
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
CAPMI	Credited Advance Payment for Metering Implementation
CBN	Central Bank of Nigeria
C&I	Commercial and Industrial
DARES	Distributed Access through Renewable Energy Scale-up
DFI	Development Finance Institution
DisCo	Distribution Company
EIB	European Investment Bank
EPC	Engineering, Procurement and Construction
EPSRA	Electric Power Sector Reform Act
FDI	Foreign Direct Investment
GCF	Green Climate Fund
GEF	Global Environment Facility
GenCo	Generation Company
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HDI	Human Development Index
IFC	International Finance Corporation
IPP	Independent Power Producer
IPT	Independent Power Transmission
MDB	Multilateral Development Bank
MDA	Ministries, Departments and Agencies
MIGA	Multilateral Investment Guarantee Agency

NBET	Nigerian Bulk Electricity Trading Company
NEMSF	Nigeria Electricity Market Stabilization Facility
NERC	Nigerian Electricity Regulatory Commission
NESI	Nigerian Electricity Supply Industry
NEP	Nigeria Electrification Project
NMMP	National Mass Metering Programme
NREEEP	National Renewable Energy and Energy Efficiency Policy
PAIF	Power and Airline Intervention Fund
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSRP	Power Sector Recovery Programme
REA	Rural Electrification Agency
REBF	Renewable Energy Blended Facility
SCADA	Supervisory Control and Data Acquisition
SCF	Solar Connection Facility
SEM	Structural Equation Modeling
SERC	State Electricity Regulatory Commission
SHS	Solar Home Systems
SPV	Special Purpose Vehicle
TCN	Transmission Company of Nigeria
USAID	United States Agency for International Development



EXECUTIVE SUMMARY

Nigeria's energy sector remains one of the most critical drivers of economic growth and national development, yet it continues to face severe infrastructure and financing challenges. Despite having an installed generation capacity of approximately 13,000 MW, only about 5,500 MW is effectively transmitted due to major transmission bottlenecks, while national electricity demand exceeds 20,000 MW. These deficits have resulted in unreliable power supply, increased production costs, and reduced industrial competitiveness.

This study examines the financing structures used in developing Nigeria's energy infrastructure, with emphasis on electricity generation, transmission, distribution, and renewable energy systems. The report evaluates public financing, private sector participation, project finance structures, public-private partnerships (PPPs), and international financing mechanisms. It also assesses the effectiveness of these approaches in addressing infrastructure gaps and identifies the major constraints limiting sustainable sector development.

The findings reveal that Nigeria's energy sector has gradually transitioned from a predominantly government-funded model to a mixed financing structure involving private investors, multilateral development banks, bilateral agencies, and blended finance initiatives. Project finance has become the dominant structure for large-scale generation projects, while blended finance and results-

based financing have supported renewable energy and off-grid electrification projects.

However, the study shows that several structural challenges continue to undermine financing effectiveness. These include persistent liquidity crises within the Nigerian Electricity Supply Industry (NESI), high Aggregate Technical, Commercial and Collection (ATC&C) losses among distribution companies, inadequate transmission infrastructure, foreign exchange volatility, policy inconsistency, weak regulatory enforcement, and limited domestic long-term financing. The transmission segment remains particularly underfunded, while the distribution segment continues to struggle with revenue collection inefficiencies and operational losses.

The report further highlights the positive economic and social impacts of renewable energy investment, including improved energy access, poverty reduction, enhanced productivity, and environmental sustainability. Empirical studies reviewed in the report confirm that renewable energy financing contributes significantly to economic growth and human development outcomes in Nigeria.

To address the identified challenges, the study recommends strengthening regulatory coordination, implementing cost-reflective tariffs with social protection mechanisms, expanding blended finance facilities, developing local currency financing instruments, scaling smart metering programs, improving NBET's

financial capacity, and establishing stronger risk mitigation frameworks. The report concludes that sustainable energy infrastructure development in Nigeria will require coordinated efforts between government, private investors, development finance institutions, and international partners to create a more bankable, transparent, and efficient energy financing environment.



CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Nigeria's energy sector represents a critical infrastructure domain characterized by significant paradoxes and financing challenges. With approximately 13,000 MW of installed generation capacity, the country effectively evacuates only 5,500 MW due to transmission bottlenecks, while national demand exceeds 20,000 MW (Isoh et al., 2023). This supply-demand gap necessitates approximately \$500 billion in capital investments above business-as-usual scenarios to achieve net-zero emissions by 2060, with \$432 billion required between 2020 and 2040 alone to establish foundational infrastructure (Federal Ministry of Power, 2023). The sector's historical underperformance persists despite the 2013 privatization of generation and distribution assets under the Electric Power Sector Reform Act 2005, as efficiency gains and anticipated investment flows have not materialized as expected (Olise et al., 2022).

The financing challenge is compounded by Nigeria's position as a developing economy with limited fiscal capacity, high perceived investment risk, and foreign exchange volatility. The Nigerian Electricity Supply Industry (NESI) continues to grapple with liquidity shortfalls, estimated billing controversies, and infrastructure decay that increase industrial production costs by approximately 40% (Olise et al., 2022). These conditions necessitate sophisticated financing structures that can

mobilize domestic and international capital while appropriately allocating risks among public and private stakeholders.

1.2 Problem Statement

Despite various policy interventions and privatization efforts, Nigeria's energy infrastructure financing remains inadequate and structurally constrained. The sector faces a fundamental financing gap where traditional public funding proves insufficient, commercial banking remains risk-averse, and private investment is deterred by regulatory uncertainty and weak institutional frameworks (Isoh et al., 2023). The privatization of electricity distribution companies in 2013 has not yielded the expected performance improvements, with aggregate technical, commercial, and collection (ATC&C) losses reaching 37.92% in 2025—significantly above the 20.54% regulatory target (Nigerian Electricity Regulatory Commission, 2025). This persistent underperformance raises critical questions about the effectiveness of current financing structures and the need for innovative approaches tailored to Nigeria's specific context.

Furthermore, the literature reveals a significant research gap regarding the direct relationship between renewable energy policy environments and measurable investment growth across different regions of Nigeria (Malabu et al., 2025). While previous studies have examined infrastructural deficiencies, decentralized planning models, and financing constraints, none provides a comprehensive,

policy-focused evaluation of how national and subnational renewable energy policies have shaped investor confidence and capital inflows over time.

1.3 Objectives of the Study

This report aims to achieve the following objectives:

- To examine the current state of Nigeria's energy sector and identify the types of infrastructure requiring financing
- To analyze existing financing structures including public funding, private sector participation, public-private partnerships, and project finance mechanisms
- To evaluate the effectiveness of current financing approaches in addressing infrastructure gaps
- To identify major challenges including funding gaps, risk allocation issues, and regulatory constraints
- To provide evidence-based recommendations for optimizing energy infrastructure financing in Nigeria

1.4 Scope of the Study

This report focuses on financing structures for electricity generation, transmission, and distribution infrastructure in Nigeria, with particular emphasis on

developments from 2013 (post-privatization) to 2025. The scope encompasses both grid-connected and off-grid renewable energy projects, examining public sector interventions, private capital deployment, multilateral financing, and innovative blended finance mechanisms. The geographical scope covers the entire Nigerian federation while acknowledging the emerging decentralization of regulatory authority to states under the Electricity Act 2023. The study draws on empirical literature, regulatory reports, and comparative international experience to inform its analysis and recommendations.

CHAPTER TWO

OVERVIEW AND FRAMEWORK

2.1 Overview of Nigeria's Energy Sector

Nigeria's energy sector is characterized by a complex mix of institutional arrangements, infrastructure deficits, and evolving regulatory frameworks. The sector comprises three main segments: generation, transmission, and distribution, each presenting distinct financing challenges and opportunities.

Generation Segment: The generation mix is dominated by natural gas (approximately 81%), with hydropower contributing the bulk of renewable generation (Isoh et al., 2023). The privatization of Power Holding Company of Nigeria (PHCN) unbundled generation assets into six generation companies (GenCos), with the government retaining ownership of the Nigerian Bulk Electricity Trading Company (NBET) as a creditworthy intermediary to solve the "market bankruptcy" problem that previously prevented independent power producers from securing financing (Isoh et al., 2023). Despite these reforms, generation capacity utilization remains suboptimal due to gas supply constraints, transmission limitations, and commercial viability challenges.

Transmission Segment: The Transmission Company of Nigeria (TCN) remains federally owned and operated, representing a significant bottleneck in the value chain. The transmission network's maximum wheeling capacity of approximately 4,000 MW is grossly inadequate for national needs, with outdated infrastructure,

inadequate redundancies, and poor voltage stability characterizing the system (JMEST, n.d.). The TCN requires an estimated \$4.2 billion in investment to modernize and expand the network, yet federal budgetary allocations prove insufficient (Olaniwun, 2025).

Distribution Segment: The privatization transferred 11 distribution companies (DisCos) to private investors, but performance has remained problematic. As of 2025, DisCos' billing efficiency stands at 76.07% while collection efficiency reaches 76.07%, yet aggregate ATC&C losses of 37.92% result in cumulative revenue losses of N158.053 billion (NERC, 2025). Only Eko DisCo achieved its ATC&C loss target in 2025/Q2, with Kaduna DisCo recording the worst performance at 70.98% losses against a 21.32% target (NERC, 2025).

2.2 Types of Energy Infrastructure

Grid-Connected Generation Infrastructure:

Large-scale gas-fired thermal plants (Azura-Edo IPP, 450 MW)

Hydropower facilities (Kainji, Jebba, Shiroro dams)

Grid-scale solar and wind installations (under development)

Embedded generation and captive power systems for industrial consumers

Transmission Infrastructure:

High-voltage transmission lines (330kV and 132kV networks)

Grid substations and switching stations

National Control Centre and regional control facilities

Supervisory Control and Data Acquisition (SCADA) systems

Distribution Infrastructure:

Medium and low-voltage distribution networks

Distribution transformers and feeder pillars

Metering systems (prepaid and smart meters)

Customer service centers and billing systems

Off-Grid and Decentralized Infrastructure:

Mini-grids (solar, diesel, or hybrid systems)

Solar home systems (SHS) for rural electrification

Productive use appliances for agricultural and commercial applications

Battery storage systems and microgrids

2.3 Financing Structures

Public Financing: Traditional government funding remains significant in Nigeria's energy sector, particularly for transmission infrastructure where private participation is limited. The Central Bank of Nigeria (CBN) has deployed multiple intervention mechanisms including the Power and Airline Intervention Fund (PAIF), Nigeria Electricity Market Stabilization Facility (NEMSF), and Solar Connection Facility (SCF) offering 10-year tenors at 10% interest with 2-year moratoriums (GIZ, 2024). However, fiscal constraints limit the scale of direct government investment, with the Federal Government requiring an estimated 70 billion naira annually just to improve generation and transmission (Academia, 2025).

Private Sector Financing: Private capital participation occurs primarily through:

Corporate Finance: Balance sheet financing by integrated utilities and large industrial consumers

Project Finance: Non-recourse lending to special purpose vehicles (SPVs) for specific generation assets

Private Equity: Sponsor equity contributions typically ranging 30-40% of project costs (higher than global standards due to elevated country risk)

Commercial Bank Lending: Limited appetite due to unfamiliarity with renewable energy portfolios and preference for short-term trade finance

Public-Private Partnerships (PPP): PPP structures have emerged as critical mechanisms for leveraging private capital while retaining public oversight:

Build-Own-Operate (BOO): Private developer retains ownership indefinitely

Build-Own-Operate-Transfer (BOOT): Asset transfers to public sector after concession period (typically 20-30 years)

Independent Power Transmission (IPT): Private investment in transmission lines with revenue from regulated use-of-system charges

Availability Payment Mechanisms: Government payments based on facility availability rather than usage

Project Finance: The predominant structure for Nigerian independent power projects, characterized by:

Non-recourse or limited-recourse lending secured solely by project cash flows

Off-balance sheet treatment preserving sponsor debt capacity

Long-term debt tenors (15-20 years) matching asset life

Complex security packages including direct agreements with offtakers

2.4 Key Institutions and Policies

Regulatory Institutions:

Nigerian Electricity Regulatory Commission (NERC): Federal regulator setting tariffs, licensing operators, and enforcing standards

Rural Electrification Agency (REA): Promotes off-grid electrification and manages federal programs

Nigerian Bulk Electricity Trading Company (NBET): Bulk purchaser and payment guarantor for GenCos

Transmission Company of Nigeria (TCN): System operator and transmission asset owner

State Electricity Regulatory Commissions (SERCs): Emerging under Electricity Act 2023 decentralization

Policy Frameworks:

Electric Power Sector Reform Act (EPSRA) 2005: Provided legal basis for unbundling and privatization

National Renewable Energy and Energy Efficiency Policy (NREEEP) 2015: Established renewable energy targets and incentives

Electricity Act 2023: Decentralized regulatory authority, allowing states to generate, transmit, and distribute electricity

Nigeria Energy Transition Plan (2022): Roadmap for achieving net-zero emissions by 2060

Power Sector Recovery Programme (PSRP): World Bank-supported reform program addressing sector liquidity

Financing Institutions:

Central Bank of Nigeria: Intervention funds and regulatory guidance

Bank of Industry (BoI): Development financing for indigenous projects

Multilateral Development Banks: World Bank, African Development Bank (AfDB), European Investment Bank (EIB)

Bilateral Agencies: USAID, DFID, GIZ, AFD (French Development Agency)

Climate Finance Institutions: Green Climate Fund (GCF), Global Environment Facility (GEF)

2.5 Empirical Literature

The empirical literature on Nigeria's energy infrastructure financing reveals several critical findings. Edet and Nwachukwu (2024) employed Structural Equation Modeling (SEM) to demonstrate that increases in renewable energy finance significantly enhance access to basic services, which in turn elevate Human Development Index (HDI) scores. Their study covering 2000-2022 established that

renewable energy investments act as catalytic platforms for social development and wellbeing.

Balogun and Adeyemi (2024) utilized Bayesian Vector Autoregression (BVAR) models to explore the response of Nigeria's economic sustainability indicators to renewable energy shocks. Using quarterly data from 2001 to 2023, they found that positive shocks in renewable energy investment led to long-lasting improvements in economic sustainability, proposing that policy prioritization of decentralized renewable systems would cushion the effects of fossil fuel volatility.

Chinonso and Okeke (2023) applied Multivariate Adaptive Regression Splines (MARS) to assess nonlinear relationships between renewable energy investment and poverty alleviation from 2000 to 2021. Their analysis identified thresholds where renewable energy investments became significantly impactful, especially in regions with previous energy deprivation, recommending scaling renewable energy in off-grid areas for maximum poverty reduction effects.

Nwankwo and Yusuf (2023) examined drivers of private sector investment in renewable energy among 200 SMEs using Tobit regression models. They found that tax incentives and policy stability significantly influenced investment decisions, with SMEs investing in solar and wind technologies reporting up to 30% increased output and 20% reduction in energy-related costs.

Comparative analysis by Isoh et al. (2023) contrasted Nigeria's financing environment with Brazil's, finding that while Brazil leveraged catalytic finance from

the Brazilian Development Bank (BNDES) to mobilize large-scale renewable investment, Nigeria remains dependent on bilateral agencies and multilateral development banks. They concluded that policy instruments and public-private partnerships need redesign to attract finance and scale market opportunities for renewable energy project developers in Nigeria.

Steffen (2018) established the theoretical foundation for project finance dominance in renewable energy, demonstrating that the structure addresses "high capital intensity, long asset life, and predictable cash flows" characteristic of energy infrastructure. However, Nigerian applications face unique constraints including counterparty risk from NBET, transmission risk from TCN's limited wheeling capacity, and currency convertibility concerns.

CHAPTER THREE

FINANCING STRUCTURES IN PRACTICE

3.1 Government Funding Mechanisms

Central Bank Intervention Facilities: The CBN has established sector-specific intervention funds to address market failures and liquidity constraints:

- Solar Connection Facility (SCF): Provides long-term, low-interest credit (7-year tenor, 10% interest, 2-year moratorium) for solar value chain enterprises, covering up to 70% of project costs with a maximum facility of N500 million for manufacturers and N10 million for vendors/retailers (GIZ, 2024)
- National Mass Metering Programme (NMMP): Addresses metering gaps to reduce commercial losses and improve revenue collection
- Nigeria Electricity Market Stabilization Facility (NEMSF): Addresses payment obligations across the electricity value chain to improve liquidity
- Power and Airline Intervention Fund (PAIF): Provides liquidity support to critical infrastructure sectors

Federal Budgetary Allocations: Direct federal investment primarily targets transmission infrastructure through the TCN capital budget and National Integrated Power Projects (NIPPs). However, budget implementation challenges, appropriation shortfalls, and competing fiscal priorities limit effectiveness. The

construction of Geregu Power Station alone cost €194,833,800, illustrating the capital intensity that exceeds federal fiscal capacity (JMEST, n.d.).

Fiscal Incentives:

- Pioneer Status: Tax holidays for renewable energy projects
- Import Duty Waivers: Reduced tariffs for renewable energy equipment
- Capital Allowances: Accelerated depreciation for energy infrastructure investments

Challenges of Public Financing:

Fiscal constraints limit scale of direct investment

"Throwing good money after bad" without fundamental market reforms

Political sensitivity of cost-reflective tariffs undermines financial viability

Weak coordination between federal and state-level interventions

Inadequate maintenance funding leading to infrastructure decay

3.2 Private Sector Participation

Independent Power Producers (IPPs): Private generation investment has focused primarily on gas-fired plants, with the Azura-Edo IPP (450 MW) serving as the flagship project finance transaction. IPPs typically utilize non-recourse project finance structures with:

- Debt-to-equity ratios of 60:40 to 70:30
- 15-20 year power purchase agreements (PPAs) with NBET or large industrial offtakers
- EPC wrap contracts transferring construction risk
- Political risk insurance from MIGA or ATI

Commercial and Industrial (C&I) Solar: Rapid growth segment driven by:

- Declining solar module costs (15% annual decline through 2024)
- Grid reliability concerns driving self-generation
- Bankable offtakers with investment-grade credit or international parent guarantees
- Shorter development timelines compared to utility-scale projects

Challenges of Private Financing:

- High cost of capital reflecting country risk premiums
- Limited long-term debt availability from commercial banks
- Foreign exchange risk for imported equipment
- Regulatory uncertainty and policy inconsistency
- Weak enforcement of contractual obligations

Domestic Institutional Investors: Pension funds and insurance companies represent potential capital pools, but participation remains limited due to:

- Regulatory constraints on alternative asset investments
- Lack of familiarity with infrastructure asset class
- Absence of investment-grade rated domestic instruments
- Maturity mismatches between liabilities and infrastructure assets

3.3 Public-Private Partnerships (PPP)

Build-Own-Operate-Transfer (BOOT) Models: Applied in generation infrastructure where private developers finance, construct, and operate facilities under long-term concessions. The Azura-Edo IPP exemplifies this structure with:

- 25-year PPA with NBET
- Availability-based payments ensuring revenue certainty
- Government guarantees for political risk coverage
- Transfer provisions at concession end

Independent Power Transmission (IPT): Emerging model for transmission infrastructure addressing TCN's investment constraints:

- Private concessionaire builds and operates transmission lines
- Revenue from regulated transmission use-of-system charges

- Availability-based rather than volume-based remuneration
- Reduces TCN's capital burden while leveraging private efficiency

Whole-of-Grid Concessions: Comprehensive private sector participation models suitable where:

- Existing utility performance falls below international benchmarks
- Significant expansion investment is required
- Regulatory capacity exists to oversee concession
- Creditworthy offtakers (distribution companies, large consumers) are present

Renewable Energy Blended Facility (REBF): Launched March 2026, this \$20 million facility exemplifies innovative PPP structuring:

- Developed by Nigeria Off-Grid Market Acceleration Program (NoMAP), SNV Netherlands Development Organisation, and United Capital Plc
- Loan sizes of \$500,000 to \$1.5 million
- Tenor up to 10 years exceeding typical commercial bank offerings
- Target: 202,000 energy access beneficiaries; 1,650 smallholder farmers; 53,000 micro-enterprises

- Leverage target: Additional \$30 million in local currency funding (BusinessDay, 2026)

Results-Based Financing (RBF): Deployed through the Nigeria Electrification Project (NEP) with three mechanisms:

- Mini-grid Minimum Subsidy Tender: Competitive capital subsidy allocation
- Performance-Based Grants: Disbursed post-verification of reliable electricity provision
- Solar Home Systems Output-Based Fund: Results-based disbursement for verified connections

3.4 International Financing and Investments

Multilateral Development Banks (MDBs): MDBs provide concessional capital critical for sector development:

- World Bank: Nigeria Electrification Project (\$550 million), Distribution Sector Recovery Program (\$500 million), DARES program targeting 17.5 million beneficiaries (GIZ, 2024)
- African Development Bank: €70 million SUNREF credit line plus €5 million grant for renewable energy and energy efficiency (GIZ, 2024)

- European Investment Bank: Concessional lending for renewable energy and grid modernization

Bilateral Development Agencies:

- USAID: Technical assistance and early-stage project development
- DFID/UKAID: £10 million de-risking facility to mobilize domestic institutional investment (GIZ, 2024)
- GIZ: Technical assistance for grid integration and regulatory capacity building
- AFD (France): SUNREF program providing credit lines through local banks

Climate Finance Mechanisms:

- Green Climate Fund (GCF): Concessional financing for transformative clean energy projects
- Global Environment Facility (GEF): \$4.35 million grant plus \$106 million co-financing for off-grid lighting solutions (2022-2027) (GIZ, 2024)
- Clean Technology Fund: Concessional financing for low-carbon technology deployment

Private International Capital:

- International Finance Corporation (IFC): \$80 million naira-denominated facility with Stanbic IBTC Bank for off-grid solar provider Sun King (GIZ, 2024)

- Foreign Direct Investment (FDI): Limited by perceived political and regulatory risks
- Export Credit Agencies: China Exim Bank financing for transmission and generation projects integrated with Chinese EPC contractors

Challenges of International Financing:

- Currency mismatch between dollar-denominated debt and naira revenues
 - Lengthy procurement processes misaligned with project timelines
 - Conditionalities requiring international competitive bidding
 - Results-based grant structures requiring 100% upfront developer financing
 - Limited coordination among bilateral agencies increasing transaction costs
- (Isoh et al., 2023)

CHAPTER FOUR

ANALYSIS AND KEY ISSUES

4.1 Effectiveness of Current Financing Structures

Generation Segment Performance: The privatization of GenCos has achieved mixed results. While private ownership has brought operational efficiencies and investment in maintenance, gas supply constraints, transmission limitations, and commercial viability challenges persist. The project finance structure for Azura-Edo demonstrates bankability potential, but replication has been limited by:

Limited NBET creditworthiness for new PPAs

Transmission constraints preventing dispatch of available capacity

Foreign exchange illiquidity affecting imported fuel and spare parts

Transmission Segment Performance: Public ownership and financing of TCN has proven inadequate, with transmission remaining the weakest link in the value chain. The inability to evacuate available generation capacity (wheeling only 5,500 MW of 13,000 MW installed) represents massive economic waste. Federal budgetary allocations cannot meet the \$4.2 billion investment requirement, yet private participation through IPT models remains underdeveloped due to:

Regulatory uncertainty regarding tariff methodologies

Perception of political risk in transmission assets

Complexity of integrating private lines with national grid

Distribution Segment Performance: The privatization of DisCos has failed to achieve anticipated performance improvements. Despite private capital injection, ATC&C losses remain at 37.92% against a 20.54% target, with only one of eleven DisCos meeting targets in 2025 (NERC, 2025). The financial viability of distribution remains compromised by:

Tariff shortfalls (difference between actual tariffs and cost-reflective rates)

High levels of unmetered customers enabling estimated billing fraud

Energy theft and vandalism

Weak enforcement of payment discipline among government ministries, departments, and agencies (MDAs) owing over N100 billion (Olise et al., 2022)

Inadequate capital expenditure on network reinforcement

Renewable Energy Financing: MDB and bilateral financing has enabled mini-grid and solar home system deployment, but scale remains insufficient. The REBF and similar blended finance structures show promise, but:

Transaction costs remain high for smaller projects

Limited domestic currency financing exposes developers to exchange rate risk

Grid integration challenges for utility-scale renewables

Policy inconsistency undermining investor confidence (Malabu et al., 2025)

4.2 Major Challenges

Funding Gaps:

- Capital Requirements: \$20 billion annually to meet energy access and transition goals
- Domestic Fiscal Constraints: Federal budget cannot fund transmission expansion requirements
- Commercial Bank Limitations: Short-term liability structures mismatch infrastructure asset life
- Equity Scarcity: Limited domestic risk capital for development-stage projects

Risk Allocation Issues:

- Construction Risk: Limited EPC contractor capacity and creditworthiness
- Revenue Risk: NBET payment delays and DisCo remittance failures (average 95.65% remittance vs. 100% requirement) (NERC, 2025)
- Foreign Exchange Risk: Import-dependent equipment procurement with volatile naira

- Political/Regulatory Risk: Policy inconsistency, tariff reversals, and regulatory capture
- Transmission Risk: TCN's inability to guarantee wheeling capacity

Regulatory and Institutional Constraints:

- Policy Inconsistency: Frequent changes in renewable energy incentives undermine investor confidence (Malabu et al., 2025)
- Weak Coordination: Limited inter-agency coordination among energy sector institutions (Isoh et al., 2023)
- Bureaucratic Delays: Lengthy licensing and permitting processes
- Decentralization Challenges: Emerging state regulatory frameworks create uncertainty under Electricity Act 2023
- Enforcement Deficits: Weak enforcement of performance agreements and market rules

Market Structure Dysfunctions:

- Liquidity Crisis: Tariff shortfalls and collection inefficiencies create circular debt
- Market Distortions: Subsidized tariffs preventing cost recovery
- Information Asymmetries: Inadequate data for demand forecasting and network planning (JMEST, n.d.)

- Vandalism and Theft: Security challenges increasing operational costs
- Technical and Commercial Losses: The persistent high ATC&C losses (37.92% in 2025) represent the most critical challenge to distribution financing viability. These losses comprise:
 - Technical losses (18.39%): Due to overloaded transformers and substandard distribution lines
 - Collection losses (23.93%): From unmetered customers, estimated billing, and payment defaults (NERC, 2025)

4.3 Impact on Energy Infrastructure Development

Economic Impact: The financing constraints have direct economic consequences:

- Industrial Productivity: Unreliable power increases production costs by 40%, reducing competitiveness (Olise et al., 2022)
- GDP Growth: Energy deficits constrain economic growth potential; empirical studies demonstrate that renewable energy investment positively influences GDP growth (Azebi & Lubo, 2025)
- Employment: Limited infrastructure investment constrains job creation in construction, operations, and manufacturing

- Fiscal Burden: Continued government subsidies and interventions divert resources from other development priorities

Social Impact:

- Energy Access: Approximately 45% of population lacks grid-connected electricity, predominantly in rural areas (Azebi & Lubo, 2025)
- Health and Education: Unreliable power affects healthcare delivery and educational outcomes
- Poverty: Energy poverty correlates with broader poverty indicators; renewable energy investments show threshold effects for poverty reduction (Chinonso & Okeke, 2023)
- Gender Equity: Women bear disproportionate burden of energy poverty; decentralized solutions offer empowerment potential

Environmental Impact:

- Carbon Intensity: Continued reliance on gas and diesel generation limits emissions reduction
- Renewable Potential: Abundant solar (5-7 kWh/m²/day) and wind resources remain underutilized

- Climate Goals: \$432 billion financing gap threatens Nigeria's net-zero 2060 commitment (Federal Ministry of Power, 2023)

Investment Climate Impact:

- Crowding Out: Public financing of operational deficits crowds out infrastructure investment
- Investor Confidence: Persistent challenges deter repeat investment and international capital
- Technology Transfer: Limited financing constrains access to advanced renewable technologies

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Key Findings

This report has examined the landscape of energy infrastructure financing in Nigeria, revealing a sector in transition yet constrained by structural deficiencies.

The key findings include:

Persistent Infrastructure Gaps: Despite privatization and policy reforms, Nigeria's energy sector continues to suffer from significant infrastructure deficits, with transmission bottlenecks limiting utilization of generation capacity and distribution losses undermining financial viability.

Financing Structure Evolution: The sector has transitioned from predominantly public financing to a mixed model incorporating project finance, multilateral development bank support, and emerging blended finance mechanisms. However, the scale of financing remains inadequate to meet investment requirements.

Project Finance Dominance: Non-recourse project finance has become the predominant structure for generation assets, enabling off-balance sheet treatment and risk isolation, but requiring sophisticated risk mitigation instruments given Nigerian market conditions.

Blended Finance Necessity: Concessional capital from MDBs and bilateral agencies remains essential for de-risking projects and crowding in commercial investment, particularly for renewable energy and off-grid solutions.

Distribution Segment Dysfunction: The privatization of DisCos has not achieved anticipated performance improvements, with ATC&C losses of 37.92% far exceeding regulatory targets and undermining sector liquidity.

Regulatory Constraints: Policy inconsistency, weak enforcement, and emerging challenges from regulatory decentralization under the Electricity Act 2023 create uncertainty that deters private investment.

Empirical Evidence: Quantitative studies confirm that renewable energy investment positively impacts economic growth, human development, and poverty reduction, providing justification for prioritized financing interventions.

5.2 Conclusion

Nigeria's energy infrastructure financing challenge is fundamentally a problem of risk allocation and institutional capacity. While the technical solutions for generation, transmission, and distribution are well understood, the financing structures required to deploy them at scale remain underdeveloped. The privatization of 2013 created the framework for private participation but failed to

address the underlying commercial and regulatory dysfunctions that prevent viable returns on investment.

The analysis demonstrates that no single financing structure can address Nigeria's energy infrastructure needs. Rather, a layered approach combining public intervention for transmission, project finance for generation, blended finance for renewable energy, and results-based financing for access expansion is required. The success of structures like the Renewable Energy Blended Facility (REBF) and the Nigeria Electrification Project demonstrates that innovative approaches can mobilize capital, but scale remains insufficient.

The empirical literature provides strong evidence that energy infrastructure investment, particularly in renewable energy, generates positive externalities for economic growth, human development, and environmental sustainability. However, these benefits are not fully internalized in market transactions, justifying continued public intervention and international support.

The path forward requires addressing the fundamental dysfunctions in the distribution segment that undermine sector liquidity, while creating enabling conditions for private capital deployment in generation and transmission. Without resolving the circular debt and collection inefficiency challenges, even the most sophisticated financing structures will fail to deliver sustainable infrastructure development.

5.3 Recommendations

Policy and Regulatory Recommendations:

Establish a National Renewable Energy Guarantee Fund to absorb early-stage project risks and provide payment security mechanisms that enhance bankability (Isoh et al., 2023).

Implement Cost-Reflective Tariffs with targeted social protection mechanisms (lifeline tariffs) to ensure commercial viability while protecting vulnerable consumers.

Strengthen Regulatory Coordination between federal and state regulators under the Electricity Act 2023 framework to prevent regulatory arbitrage and ensure consistent standards.

Enforce Performance Agreements with DisCos through credible sanctions for non-compliance with ATC&C loss targets, including potential license revocation for persistent underperformers.

Financing Structure Recommendations:

Scale Blended Finance Facilities by expanding the REBF model to utility-scale projects through DFIs (IFC, AfDB, DBSA), creating construction financing facilities that reduce 100% upfront equity requirements for developers.

Develop Local Currency Financing instruments to reduce foreign exchange risk, building on the IFC-Stanbic IBTC naira facility template and CBN Solar Connection Facility structure.

Establish Infrastructure Debt Funds to aggregate domestic institutional capital (pension funds, insurance) for energy infrastructure investment, with government seed capital and first-loss provisions to enhance risk-adjusted returns.

Deploy Viability Gap Funding for strategic transmission investments where regulated tariffs cannot support full cost recovery, prioritizing lines that relieve generation evacuation constraints.

Institutional Recommendations:

Create a Unified Investment Promotion Agency (one-stop shop) for energy project permitting to reduce bureaucratic delays and transaction costs (Isoh et al., 2023).

Strengthen NBET Financial Capacity through capital injection and payment security mechanisms to restore creditworthiness for new generation PPAs.

Implement Smart Metering at Scale through the MAP and CAPMI frameworks to reduce commercial losses and improve revenue collection.

Risk Mitigation Recommendations:

Expand Political Risk Insurance utilization through MIGA, ATI, and national guarantee schemes to reduce cost of capital for international investors.

Standardize PPA and Concession Templates to reduce transaction costs and legal uncertainty for project developers.

Establish Grid Integration Standards and upgrade TCN infrastructure to accommodate utility-scale renewable energy deployment.

International Cooperation Recommendations:

Consolidate Climate Finance through a multi-stakeholder platform that coordinates bilateral, multilateral, and private capital flows to reduce transaction costs and improve efficiency (Isoh et al., 2023).

Leverage South-South Cooperation through the Nigeria-China Investment Platform to blend Chinese policy bank financing with Western and domestic capital for integrated generation-transmission solutions.

Monitoring and Evaluation:

Establish Transparent Performance Metrics for all financed projects with public disclosure requirements to ensure accountability.

Conduct Periodic Review of financing structure effectiveness with adaptive management to respond to changing market conditions.

The implementation of these recommendations requires political will, institutional capacity building, and sustained commitment from both public and private stakeholders. The cost of inaction—continued energy poverty, constrained economic growth, and missed climate targets—far exceeds the investment required to transform Nigeria's energy infrastructure financing landscape.

REFERENCES

Adebayo, T. S., & Alimi, O. Y. (2023). Energy access and economic development in Nigeria. *Journal of Energy Access and Innovation*, 8(1), 45–60.

Azebi, O. I., & Lubo, E. (2025). The role of renewable energy investment in sustainable economic development in Nigeria. *Cross Current International Journal of Economics, Management and Media Studies*, 7(4), 82–90.

Balogun, O., & Adeyemi, A. (2024). Renewable energy shocks and economic sustainability in Nigeria: A Bayesian VAR approach. *Energy Economics Letters*, 11(2), 45–62.

BusinessDay. (2026, March 30). Nigeria's renewable energy sector gets \$20m blended finance push. BusinessDay Nigeria. <https://businessday.ng/energy/article/nigerias-renewable-energy-sector-gets-20m-blended-finance-push/>

Chinonso, O., & Okeke, P. (2023). Renewable energy investment and poverty alleviation in Nigeria: A MARS approach. *Journal of African Development*, 25(3), 112–135.

Edet, E. O., & Nwachukwu, C. A. (2024). Renewable energy finance and human development in Nigeria: Structural equation modeling approach. *Energy and Development Journal*, 15(1), 78–95.

Federal Ministry of Power. (2023). Nigeria energy transition plan: Finance and investment. Energy Transition Office. <https://www.energytransition.gov.ng/finance-and-investment/>

GIZ. (2024). Nigerian market report: May 2024 (GET.transform Report). Deutsche Gesellschaft für Internationale Zusammenarbeit. <https://www.ruralelec.org/wp-content/uploads/2024/07/GT081-Horizontal-Report-D7-DRE-Market-Report-Nigeria-Final-v3-designed.pdf>

Hou, H., Wang, Y., & Zhang, L. (2023). Green finance drives renewable energy development: Empirical evidence from 53 countries worldwide. *Environmental Science and Pollution Research*, 30(33), 80573–80590. <https://doi.org/10.1007/s11356-023-28111-w>

Isoh, A., Dioha, M. O., Debnath, R., Kumar, A., & Dziubinski, M. (2023). Financing renewable energy: Policy insights from Brazil and Nigeria. *Energy, Sustainability and Society*, 13(1), 2. <https://doi.org/10.1186/s13705-022-00348-1>

JMEST. (n.d.). The Nigeria electric power sector: Opportunities and challenges. *Journal of Multidisciplinary Engineering Science and Technology*. <https://www.jmest.org/wp-content/uploads/JMESTN42350093.pdf>

Malabu, M. B., Magaji, S., & Jafaru, Y. (2025). Examining the contribution of Nigeria's renewable energy policy environment to investment growth and sectoral advancement. *International Journal of Innovation and Development Policy Studies*, 23(2), 45–67.

Nigerian Electricity Regulatory Commission. (2020). Quarterly report 2020 Q2. NERC. <https://africacheck.org/sites/default/files/media/documents/2021-05/NERC%2BSecond%2BQuarter%2BReport%2B2020.pdf>

Nigerian Electricity Regulatory Commission. (2025). Quarterly report 2025 Q2. NERC. https://nerc.gov.ng/wp-content/uploads/2025/10/2025_Q2-Report.pdf

Nwankwo, S., & Yusuf, R. (2023). Determinants and outcomes of SME investment in renewable energy in Nigeria: A Tobit model approach. *Journal of African Business and Energy Economics*, 10(2), 67–90.

Olaniwun, A. (2025, February 18). Breaking the cycle of recurrent nervous system collapse: Thoughts on attracting private investment for transmission network renewal. Olaniwun Ajayi LP. <https://www.olaniwunajayi.net/blog//breaking-the->

[cycle-of-recurrent-nervous-system-collapse-thoughts-on-attracting-private-investment-for-transmission-network-renewal/](#)

Olise, C. N., Amujiri, B. A., Emeh, I. E., & Ugwuibe, C. O. (2022). Post-privatization power sector performance: X-raying the experiences of customers in Enugu State, South-East Nigeria. *Management and Human Resource Research Journal*, 11(9), 18–30.

Omale, A. M. (2023). An assessment of the privatization of the power sector in Nigeria: A study of Karu Local Government of Nasarawa State. *International Journal of Current Research in International Relations and Development Studies*, 8(1), 45–58.

Osei, S. A., & Eze, M. O. (2023). Foreign direct investment in renewable energy and macroeconomic performance in Nigeria: A CVAR model. *Energy Economics Letters*, 10(1), 1–15.

Steffen, B. (2018). The importance of project finance for renewable energy projects. *Energy Economics*, 69, 280–294. <https://doi.org/10.1016/j.eneco.2017.11.015>

Sy, A., & Copley, A. (2017). Closing the financing gap for African energy infrastructure: Trends, challenges and opportunities. Africa Growth Initiative at Brookings Institute Policy Brief. <https://www.brookings.edu/research/closing-the-financing-gap-for-african-energy-infrastructure-trends-challenges-and-opportunities/>