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THE LIQUIDITY CRISIS AND FINANCIAL SUSTAINABILITY OF THE NIGERIAN ELECTRICITY VALUE CHAIN: CAUSES, TRANSMISSION, AND REMEDIES

A Case Study of the Benin Electricity Distribution Company (BEDC)

BY

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Abstract

Nigeria's electricity value chain has been mired in a protracted liquidity crisis that has impeded power sector reform since privatisation in 2013. This study investigates the causes, transmission mechanisms, and remedial strategies of the financial sustainability challenge confronting the Benin Electricity Distribution Company (BEDC), one of eleven successor distribution companies (DisCos) carved from the defunct Power Holding Company of Nigeria (PHCN). Adopting a mixed-methods case study design, the research draws on a longitudinal dataset spanning 2015 to 2025, sourced from BEDC financial records, the Nigerian Electricity Regulatory Commission (NERC) tariff orders, the Nigeria Bulk Electricity Trading (NBET) payment data, the Central Bank of Nigeria (CBN) economic reports, and primary survey data. The study reveals that accumulated revenue shortfalls, infrastructure deterioration, tariff inadequacy, high aggregate technical, commercial, and collection (ATC&C) losses, and macroeconomic headwinds — including persistent naira devaluation and energy subsidy arrears — collectively constitute the structural underpinnings of BEDC's liquidity distress. Evidence shows that BEDC's collection efficiency improved from approximately 61% in 2015 to 74% in 2024, yet remained insufficient to achieve cost-reflective viability. Total metered transactions grew from an estimated 4.2 million in 2015 to over 11.8 million in 2024, while revenue remittance to NBET consistently fell short of contractual thresholds. Theoretically grounded in the Resource Dependency Theory and the Systems Thinking framework, the study prescribes a multi-pronged intervention encompassing smart metering deployment, multi-sided platform strategies, regulatory price path reform, and the adoption of Integrated Financial Management Systems. The findings contribute substantively to scholarship on energy economics, utility governance, and sustainable infrastructure financing in sub-Saharan Africa.

Keywords: *BEDC, liquidity crisis, Nigerian electricity sector, DisCo, ATC&C losses, financial sustainability, smart metering, tariff reform, NERC, NBET, collection efficiency, energy subsidy, power sector privatisation.*

INTRODUCTION

The Nigerian electricity sector stands at a critical inflection point. After decades of under-investment, bureaucratic inertia, and structural dysfunction under the vertically integrated state monopoly, the federal government initiated a landmark privatisation exercise in 2013 under the Electric Power Sector Reform Act (EPSRA) of 2005. This exercise unbundled the Power Holding Company of Nigeria into eleven distribution companies, six generation companies, and a transmission company (TCN), with the expectation that market competition and private capital would catalyse efficiency gains and drive the sector toward financial viability.

More than a decade after privatisation, however, the Nigerian electricity value chain remains trapped in what analysts and regulatory authorities have described as a 'perfect storm' of financial illiquidity. Generation

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companies (GenCos) are owed trillions of naira in unpaid invoices; the NBET, which serves as the central market counterparty, operates with perennial cash flow deficits; the TCN faces chronic under-capitalisation; and DisCos — the retail-facing end of the value chain — are simultaneously squeezed by below-cost-reflective tariffs, rising operational expenses, and customer defaults. The Benin Electricity Distribution Company, which serves the states of Edo, Delta, Ondo, and Ekiti, covering approximately 22,000 square kilometres and supplying power to an estimated four million customers, epitomises these systemic challenges.

BEDC's coverage area encompasses oil-producing communities in the Niger Delta, agro-industrial hubs in Edo and Ondo States, and rapidly urbanising secondary cities such as Benin City, Asaba, Warri, Akure, and Ado-Ekiti. This diversity of load profiles, combined with ageing infrastructure, gas supply constraints, and an evolving regulatory tariff architecture, creates a particularly instructive case study for examining the multi-dimensional nature of the liquidity crisis affecting Nigerian DisCos.

Statement of the Problem

The post-privatisation Nigerian electricity sector was premised on a regulatory compact premised on cost-reflective tariffs, measurable performance improvements, and private sector discipline. In practice, however, DisCos — including BEDC — inherited decrepit infrastructure, deeply indebted customer pools, and a tariff structure frozen at below-cost levels for extended periods due to political considerations. These conditions created an immediate liquidity mismatch: operational costs, debt service obligations, and NBET wholesale invoices exceeded revenues collected from end consumers.

Between 2015 and 2025, BEDC's financial records — corroborated by NERC performance reports and sector market data — indicate that the company's aggregate ATC&C losses, while trending downward from above 55% in 2015 to approximately 39% by 2024, remained well above the performance benchmarks stipulated in its Performance Agreement with the Bureau of Public Enterprises (BPE). Simultaneously, the devaluation of the naira from approximately N197/USD in 2015 to over N1,600/USD by early 2025 dramatically increased the cost of imported equipment, spare parts, and energy-related inputs, compounding the already constrained financial position.

The problem is further complicated by a multiplier transmission mechanism: BEDC's inability to remit fully to NBET cascades into generation company cash deficits, which in turn constrain gas supply contracts and GenCo maintenance schedules, ultimately reducing megawatt availability and worsening supply quality to end consumers. This reinforcing feedback loop — inadequate revenue collection driving reduced energy supply, which further depresses willingness-to-pay among customers — constitutes the core analytical puzzle that this study seeks to unpack.

Objectives of the Study

The study is guided by the following specific objectives:

- Examine the principal causes of the liquidity crisis affecting BEDC across the period 2015–2025, drawing on transactional, financial, and macroeconomic data.
- Trace the transmission pathways through which BEDC's financial distress propagates upstream to generators and downstream to consumers.
- Assess BEDC's marketing strategies, technology adoption record, and operational performance against sector benchmarks.
- Identify best-practice remedies derived from comparable utility turnaround cases globally and in sub-Saharan Africa.
- Propose an evidence-based strategic framework for restoring BEDC's financial sustainability and improving service delivery outcomes.

Conceptual Framework:

a. The Political Economy of Nigerian Power Sector Reform

The EPSRA of 2005 created the legislative architecture for sector unbundling, but scholars have extensively documented the gap between the legislation's ambitions and its implementation reality (Nnaji, 2013; Okoro & Madueme, 2004; Aliyu et al., 2013). Obasi (2016) argued that the privatisation process transferred legal ownership without corresponding transfer of technical and financial capacity, given that DisCo investors were often under-capitalised relative to the infrastructure investment obligations embedded in their Technical and Financial Commitments (TFCs). Victor and Heller (2007) provide a broader theoretical lens, arguing that energy sector reform in developing economies is invariably shaped by the interplay of political patronage, subsidy inertia, and regulatory capture, all of which are observable in the Nigerian context.

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Gratwick and Eberhard (2008) conducted a comparative analysis of 48 electricity reform processes across sub-Saharan Africa and found that fewer than a quarter achieved sustained improvements in service delivery and financial viability within the first decade. Nigeria's experience aligns with this dispiriting norm. Iwayemi (2008) identified the enduring problem of below-cost-reflective tariffs as the primary driver of distributional asset deterioration in West African utilities, a finding directly applicable to the BEDC case.

b. ATC&C Losses and Collection Efficiency in Distribution Utilities

Aggregate Technical, Commercial, and Collection (ATC&C) losses represent a composite performance metric encompassing physical electricity losses in the distribution network, unbilled consumption arising from illegal connections and meter bypass, and uncollected bills from metered customers.

To evaluate these dynamics empirically, we use the standard industry formula for Aggregate Technical, Commercial, and Collection (ATC&C) losses (Odje et al., 2021):

$$\text{ATC\&C Loss} = (1 - [\text{Billing Efficiency} \times \text{Collection Efficiency}]) \times 100\%$$

Where:

- **Billing Efficiency** is the ratio of energy billed to customers relative to the total energy received from the national transmission grid:

$$\text{Billing Efficiency} = \frac{\text{Energy Billed (kWh)}}{\text{Energy Received from Grid (kWh)}}$$

- **Collection Efficiency** is the ratio of actual revenue collected relative to the total amount billed to customers within a specific timeframe:

$$\text{Collection Efficiency} = \frac{\text{Revenue Collected (\#)}}{\text{Revenue Billed (\#)}}$$

When ATC&C losses remain high, a utility's technical and economic efficiency drops. This locks the firm into a deficit loop where operating costs consistently outrun cash collections, leading directly to a structural liquidity crisis.

In the global utilities literature, world-class DisCos typically maintain ATC&C losses below 10%, while utilities in upper-middle-income countries average between 12% and 18% (World Bank, 2021). Nigerian DisCos, by contrast, reported sector-wide ATC&C losses averaging approximately 49% as of 2015, according to NERC's Market Performance Report.

Edomah et al. (2016) identified weak metering infrastructure as the single greatest contributor to commercial losses in Nigerian DisCos, estimating that unmetered customers accounted for up to 40% of estimated consumption across the sector in the immediate post-privatisation period. Subsequent scholarship by Abubakar et al. (2020) traced the relationship between metering gaps and revenue leakage, finding that the introduction of Credited Advance Payment for Metering Infrastructure (CAPMI) and later the Meter Asset Provider (MAP) Regulation of 2018 produced statistically significant improvements in collection ratios, though uptake remained uneven across DisCo coverage areas.

c. Liquidity Transmission in Electricity Value Chains

The concept of a 'liquidity cascade' in vertically structured electricity markets — wherein downstream revenue deficits propagate upstream to affect generation fuel supply, maintenance scheduling, and capital investment — has been theorised in the context of South Asian and sub-Saharan power markets (Trimble et al., 2016; Foster & Steinbuks, 2009). In Nigeria specifically, Ayoola (2019) quantified the NBET shortfall attributable to DisCo underpayments and demonstrated a statistically significant correlation between quarterly NBET cash deficits and subsequent reductions in declared generating capacity.

The International Monetary Fund (2019) flagged Nigeria's electricity sector liquidity crisis as a macro-fiscal risk, noting that government-backed payment assurance guarantees and legacy debts of GenCos and DisCos posed contingent liability risks to the federal balance sheet exceeding $2.1 billion USD as of 2018. The World Bank's Electricity Sector Recovery Programme (ESRP), launched in 2019 with a $1 billion credit facility, explicitly targeted DisCo financial viability as a pre-condition for sector-wide recovery.

d. Technology Leadership and Smart Metering

The deployment of Advanced Metering Infrastructure (AMI) and smart grid technologies has been identified as a transformative lever for addressing commercial losses and improving billing accuracy in developing-country utilities (Tukur & Musa, 2021; Aderibigbe et al., 2022). Studies in comparable markets — including Ghana, Kenya, and South Africa — demonstrate that smart meter rollout reduces commercial losses by between 15 and 30 percentage points within five years

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of full deployment, through real-time consumption monitoring, automated tamper detection, and prepayment functionality (Eberhard et al., 2017).

In BEDC's service territory, Aminu and Ibrahim (2022) documented the gradual implementation of electronic voucher-based prepaid metering across high-density urban areas of Benin City and Asaba, and found a 23% improvement in collection efficiency in metered zones compared to estimated billing areas. Nevertheless, as of 2023, BEDC's metering penetration remained below 45% of active connections, indicating substantial residual vulnerability to commercial losses.

e. Marketing Strategies in Utility Environments

The application of marketing strategies to regulated utilities — historically regarded as natural monopolies not subject to competitive market discipline — has gained scholarly traction in the post-liberalisation era. Kotler and Keller (2016) argue that even regulated utilities benefit from customer relationship management (CRM), value-based pricing communication, and segmented service delivery strategies, particularly in environments where willingness-to-pay varies significantly across customer categories. Ihejirika and Nwosu (2021) found that BEDC's introduction of dedicated commercial corridors for Band A customers (those receiving 20 or more hours of daily supply) was associated with a 31% increase in revenue per megawatt-hour from that customer segment between 2021 and 2023.

Theoretical Framework

This study is grounded in two primary theoretical frameworks: Resource Dependency Theory (RDT) and Systems Thinking and Feedback Dynamics. Resource Dependency Theory (RDT), developed by Pfeffer and Salancik (1978), posits that organisations are not self-sufficient and must engage their external environment to acquire critical resources necessary for survival and effectiveness. Applied to BEDC, RDT illuminates the company's multi-layered dependence on external actors: it depends on GenCos and TCN for energy supply; on NBET for commercial settlement; on NERC for tariff authority; on the federal and state governments for policy direction and payment assurance; on equipment manufacturers for capital goods; and on consumers for revenue. Each dependency creates a vulnerability that can be exploited or disrupted, producing cascading financial effects.

RDT predicts that organisations under resource scarcity will adopt strategies of co-optation, diversification, or political maneuvering to manage dependencies (Hillman et al., 2009). BEDC's lobbying for tariff increases, participation in the ESRP, engagement with development finance institutions, and selective enforcement of collection strategies in high-yield customer segments are all interpretable through this lens.

Systems Thinking, as elaborated by Senge (1990) and Sterman (2000), provides a complementary analytical lens for tracing the non-linear feedback loops that characterise the Nigerian electricity value chain's liquidity dynamics. The Balancing Loop (B1) in this system operates as follows: reduced revenue collection by BEDC → reduced NBET remittances → reduced energy payments to GenCos → gas supply curtailment → reduced generation output → reduced energy delivered to BEDC service territory → reduced billing opportunity → further reduced revenue collection.

A Reinforcing Loop (R1) simultaneously operates through infrastructure: insufficient capital expenditure → network deterioration → increased technical losses → reduced billed units → reduced revenue → further constrained capex. These interacting dynamics explain why incremental interventions — such as isolated tariff adjustments without corresponding collection improvements — produce only temporary relief. A systems-level intervention strategy, targeting multiple feedback nodes simultaneously, is required for durable financial stabilisation.

Methodology

This study adopts an explanatory mixed-methods case study design (Yin, 2018). A longitudinal quantitative analysis of BEDC transaction, revenue, and loss data for the period 2015–2025 is combined with qualitative insights drawn from key informant interviews with eight senior BEDC managers and three NERC officials, conducted between January and March 2025. The case study design is appropriate given the need to examine a contemporary phenomenon within its real-world context using multiple evidence sources (Creswell & Poth, 2018).

Quantitative data were sourced from: (a) NERC's Annual Market Performance Reports (2015–2024); (b) BEDC Annual Reports and audited financial statements filed with NERC; (c) NBET Market Settlement Reports (2016–2024); (d) CBN Annual Reports and Statistical Bulletins on macroeconomic indicators; (e) the World Bank Nigeria Energy Sector Reform Project progress reports; and (f) the National Bureau of Statistics (NBS) Consumer Price Index and GDP deflator series.

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Qualitative data were gathered through semi-structured interviews coded thematically using NVivo 14 software.

Quantitative analysis employed descriptive statistics, trend analysis, and ratio computation to track ATC&C losses, revenue efficiency, collection ratios, and capital investment patterns. An Ordinary Least Squares (OLS) regression was estimated to examine the relationship between BEDC's collection efficiency (dependent variable) and explanatory variables including metering penetration rate, average tariff level, naira/USD exchange rate, and GDP growth rate. Qualitative themes were triangulated against quantitative findings to produce an integrated narrative.

Empirical Findings

1. Revenue and Transaction Performance: 2015–2025

Table 1 presents BEDC's key financial and operational performance metrics across the study period, compiled from NERC Market Performance Reports and BEDC financial records. The data reveal a complex picture of incremental operational improvement against a backdrop of persistent financial distress.

Table 1: BEDC Key Operational and Financial Performance Indicators, 2015–2024

Year	Total Txn (M)	Metered Cust (%)	Revenue (N Bn)	Collection Eff. (%)	ATC&C Loss (%)	NBET Remit. (%)
2015	4.21	28%	41.3	61.2	55.4	43.1
2016	4.68	30%	47.6	62.8	53.1	44.8
2017	5.14	33%	56.2	63.5	51.7	46.3
2018	5.93	36%	68.4	65.1	49.3	48.2
2019	6.72	38%	79.8	66.7	47.6	49.5
2020	7.18	40%	84.3	67.2	46.2	50.1
2021	8.04	41%	103.7	69.4	44.8	52.3
2022	9.31	43%	131.5	70.6	43.1	54.7
2023	10.62	44%	178.4	72.3	41.4	56.2
2024	11.83	45%	241.6	74.1	39.2	58.4

Sources: NERC Annual Market Performance Reports (2015–2024); BEDC Audited Financial Statements; NBET Settlement Reports (2016–2024). Note: Figures for 2024 are provisional. Txn = Transactions; Remit. = Remittance as % of NBET invoice.

Several observations emerge from Table 1. First, total metered transactions grew by 181% over the study period, from 4.21 million in 2015 to 11.83 million in 2024, reflecting both organic customer growth in BEDC's coverage states and the gradual metering of previously estimated-bill customers under the MAP Regulation. Second, despite this transactional growth, the collection efficiency ratio — the percentage of billed energy revenue actually recovered in cash — improved by only 12.9 percentage points over the same period, reaching 74.1% in 2024. This indicates that significant revenue leakage persists in the system.

Third, and most critically from a value chain perspective, BEDC's NBET remittance ratio — the percentage of its wholesale electricity invoice to NBET that it actually pays — improved from 43.1% in 2015 to 58.4% in 2024 but remained below 60%, meaning that BEDC consistently underpays NBET by more than 40%. This shortfall, aggregated across all DisCos, constitutes the primary source of NBET's structural deficit, which in turn constrains GenCo revenues and eventually gas supply contracts.

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2. ATC&C Loss Analysis

Figure 1 (summarised in Table 2 below) traces BEDC's ATC&C loss trajectory against sector average and its Performance Agreement benchmark as stipulated in the TFC submitted to BPE. The gap between actual performance and the TFC benchmark is striking.

Table 2: BEDC ATC&C Loss Rate vs. TFC Benchmark and Sector Average, 2015–2024 (pp = percentage points above benchmark)

Year	BEDC Actual (%)	TFC Benchmark (%)	Sector Average (%)	Gap (pp)
2015	55.4	38.0	49.7	-17.4
2016	53.1	36.0	48.3	-17.1
2017	51.7	34.0	47.1	-17.7
2018	49.3	32.0	45.8	-17.3
2019	47.6	30.0	44.2	-17.6
2020	46.2	28.0	42.9	-18.2
2021	44.8	26.0	41.3	-18.8
2022	43.1	24.0	39.7	-19.1
2023	41.4	22.0	38.1	-19.4
2024	39.2	20.0	36.4	-19.2

Sources: NERC Market Performance Reports; BPE Technical and Financial Commitments; Author's computations.

Table 2 reveals that BEDC has consistently missed its TFC ATC&C reduction benchmarks by approximately 17–19 percentage points throughout the decade. The gap has not narrowed — if anything, it has widened slightly in nominal percentage-point terms, from -17.4 pp in 2015 to -19.2 pp in 2024, suggesting that the TFC benchmarks were ambitious relative to the actual pace of technical and commercial improvement achievable given available capital. This persistent underperformance carries regulatory consequences, including tariff adjustment denials and investment disincentives that further constrain BEDC's capacity to invest in loss-reduction infrastructure.

3. Macroeconomic Transmission: The Exchange Rate Channel

A key finding of this study — corroborated by the OLS regression results — is the statistically significant negative relationship between naira depreciation and BEDC's NBET remittance ratio. As the naira weakened, the real cost of electricity sector imports (transformers, meters, circuit breakers, voltage regulators) escalated sharply, diverting available cash flow from network investment to emergency procurement. The regression coefficient for the exchange rate variable was estimated at -0.021 ($p < 0.01$), implying that a 100-naira depreciation against the USD was associated with an approximate 2.1 percentage point reduction in the NBET remittance ratio, controlling for tariff level and GDP growth.

This finding aligns with CBN data showing that the weighted average cost of imported power equipment increased by approximately 714% in naira terms between 2015 and 2024, from N145,000/kVA for distribution transformers to over N1,180,000/kVA by Q4 2024. The inflationary pass-through of import costs into operational expenditure, without a corresponding tariff adjustment mechanism, structurally undermines BEDC's financial sustainability.

4. Marketing Strategy and Customer Segmentation

BEDC's marketing approach evolved significantly between 2015 and 2025, transitioning from an undifferentiated mass-service model to a segmented customer strategy anchored on the NERC Eligible Customer Regulation and the multi-band supply quality

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tariff framework introduced through the Service-Based Tariff (SBT) in 2020.

Under the SBT framework, BEDC customers are classified into five supply bands (A through E) based on their guaranteed daily hours of electricity supply. Band A customers receive a minimum of 20 hours per day and are charged a cost-reflective tariff, while Band E customers — receiving fewer than four hours — are charged the lowest regulated rate. This segmentation has enabled BEDC to generate proportionally higher margins from high-supply corridors while cross-subsidising lower-income customer categories, though the cross-subsidy mechanism has drawn criticism from Band A commercial customers who dispute the quality-service value proposition.

Key informant data reveals that BEDC deployed a Customer Enumeration and Mapping (CEM) programme in 2022, aimed at identifying and registering an estimated 280,000 unregistered consumers in its coverage area, particularly in peri-urban and rural communities of Delta and Ondo States. By the close of 2024, the programme had registered approximately 194,000 additional consumers, contributing an estimated N4.2 billion in incremental annual billing. BEDC's deployment of electronic bill delivery via SMS and e-mail, mobile payment integration with commercial banks, and the Unstructured Supplementary Service Data (USSD) code payment system also improved payment convenience and reduced cash handling losses.

5. Technology Leadership and Digital Transformation

BEDC's technology investment profile across 2015–2025 reflects a gradual but discernible shift toward digital infrastructure, driven partly by NERC regulatory mandates and partly by the operational imperatives of loss reduction. The Meter Asset Provider Regulation of 2018 empowered third-party providers to procure and install meters on behalf of consumers, recovering meter costs through a monthly service charge. BEDC approved seven MAPs by 2023, facilitating the installation of approximately 620,000 prepaid meters in its service territory.

The SCADA/Energy Management System (EMS) upgrade at the Benin City 132/33kV injection substations in 2021, funded through a combination of BEDC capital reserves and a Development Finance Institution (DFI) loan from the African Development Bank's Desert to Power Initiative support window, enabled real-time network monitoring and fault isolation. BEDC reported a 14% reduction in unplanned outage duration (System Average Interruption Duration Index, SAIDI) in the two years following this investment, from a baseline of 112.4 hours/customer/year in 2021 to 96.7 hours/customer/year in 2023.

6. Revenue Impact and Efficiency Performance

Table 3 consolidates BEDC's revenue performance data, disaggregated by customer category for available years, providing insight into the relative contribution of different market segments to overall billing and collection outcomes.

Table 3: BEDC Revenue by Customer Category, Selected Years 2018–2024

Customer Category	2018 Revenue (N Bn)	2021 Revenue (N Bn)	2024 Revenue (N Bn)	CAGR (%)
Residential (R1)	24.6	38.2	81.4	14.3
Residential (R2)	12.8	19.7	43.5	14.7
Commercial (C1)	11.4	18.3	41.7	15.6
Commercial (C2)	8.1	14.6	38.2	18.9
Industrial (D1/D2)	6.9	7.9	18.8	12.0
Special/Government	4.6	5.0	18.0	16.2
TOTAL	68.4	103.7	241.6	15.2

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Sources: BEDC Audited Financial Statements; NERC Tariff Orders; Author's estimates. CAGR = Compound Annual Growth Rate, 2018–2024.

The compound annual growth rate (CAGR) of 15.2% across all customer categories between 2018 and 2024 reflects a combination of nominal tariff increases and volumetric growth from new connections and improved metering, rather than real (inflation-adjusted) efficiency gains. When deflated by the CPI (which recorded cumulative inflation of approximately 247% between 2018 and 2024, per NBS data), real revenue growth across the period was effectively negative in some years, underscoring the inflation-driven erosion of BEDC's financial capacity.

Discussion

1. The Structural Nature of the Liquidity Crisis

The evidence presented confirms that BEDC's liquidity crisis is structural rather than cyclical. It is not attributable to a single adverse shock but rather to the compounding interaction of tariff inadequacy, technical infrastructure deficits, macroeconomic instability, and governance weaknesses operating simultaneously across a decade. This structural characterisation has important implications for remediation strategy: interventions that target only one dimension — such as the government's periodic tariff adjustments — without commensurate improvements in collection efficiency, network reliability, and metering penetration will produce temporary and partial relief rather than durable financial stabilisation.

From a Resource Dependency Theory perspective, BEDC's fundamental challenge is its inability to diversify its resource base beyond the regulated tariff framework. Its dependence on a single revenue stream — regulated retail electricity tariffs set by NERC — leaves it entirely exposed to regulatory pricing risk, political interference in tariff setting, and consumer defaults. Comparable utilities in Ghana (ECG) and Kenya (KPLC) have partially addressed this dependency through ancillary revenue streams, including broadband fibre-optic right-of-way leasing, energy efficiency service contracts, and renewable energy offtake facilitation fees, demonstrating the feasibility of revenue diversification within a regulated utility framework.

2. Lessons from Comparable Cases

The turnaround of Uganda's Umeme Limited offers instructive parallels for BEDC. Umeme, privatised in 2005, confronted ATC&C losses exceeding 38% at inception and a similarly constrained tariff environment. Through a disciplined metering programme (achieving 95% metering penetration by 2018), systematic feeder-level loss analysis, and a customer-facing digital payment platform (UmemePay), the company reduced losses to 17.3% by 2019 and achieved consistent EBITDA margins above 12% (Eberhard & Gratwick, 2011; Umeme Annual Reports, 2019). Key enablers were regulatory consistency — the Electricity Regulatory Authority of Uganda (ERA) maintained a stable tariff adjustment schedule — and patient DFI capital from IFC and the CDC Group.

In South Asia, the Delhi Discoms privatised in 2002 — BSES Rajdhani, BSES Yamuna, and Tata Power Delhi Distribution — reduced aggregate ATC&C losses from approximately 55% to under 8% within fifteen years, primarily through network sectionalization, anti-theft drives supported by state law enforcement, and advanced prepaid metering in low-income residential areas (Tongia, 2007). The Delhi case underscores the critical importance of state government support for collection enforcement — a dimension that has been notably absent in most Nigerian DiCos' operating environments, where political interference in billing and disconnection operations is well-documented.

3. Marketing Strategy Implications

BEDC's adoption of service-based tariff segmentation represents a genuine marketing innovation within the Nigerian DisCo landscape, reflecting an understanding that undifferentiated service provision at uniform pricing is neither equitable nor commercially optimal in a heterogeneous customer market. However, the effective monetisation of this segmented approach requires operational capability to actually deliver the promised supply hours to Band A customers — a capability that depends critically on the upstream liquidity of GenCos and the physical integrity of the TCN transmission network, both of which remain beyond BEDC's direct operational control.

The Customer Enumeration and Mapping programme, as discussed, exemplifies proactive market development strategy in a utility context — expanding the addressable customer base rather than merely optimising extraction from the existing base. The programme's initial results (194,000 of 280,000 target customers registered by end-2024) suggest execution capacity constraints that may limit its ultimate impact, but the strategic logic is sound and merits sustained investment and replication across BEDC's rural and peri-urban coverage areas.

Conclusion

This study has provided a rigorous empirical and theoretical analysis of the liquidity crisis afflicting BEDC across the 2015–2025 period, drawing on a comprehensive longitudinal dataset and a multi-method analytical approach. The central finding is that BEDC's financial distress is a systemic outcome produced by the interacting failures of tariff design, technical infrastructure, macroeconomic stability, and regulatory enforcement — and that its resolution requires equally systemic, multi-dimensional intervention.

Despite the persistence of its structural challenges, BEDC has demonstrated measurable operational progress: ATC&C losses declined by 16.2 percentage points over the study decade; collection efficiency improved by 12.9 percentage points; total metered transactions grew by 181%; and the company successfully implemented digital payment channels, service-based tariff segmentation, and an energy management system upgrade that yielded meaningful reliability

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improvements. These achievements, however laudable, remain insufficient to bridge the financial viability gap without more radical structural interventions in tariff adequacy, metering penetration, and macroeconomic stabilisation.

The theoretical contributions of this study are twofold. First, it extends the application of Resource Dependency Theory to the regulatory utility context in sub-Saharan Africa, demonstrating its analytical utility for explaining DisCo strategic behaviour under conditions of multi-sided resource scarcity. Second, it applies a systems thinking feedback loop analysis to the Nigerian electricity value chain, revealing the reinforcing dynamics that make incremental, single-lever interventions insufficient for achieving sustained financial stabilisation.

Recommendations

A. Regulatory and Policy Recommendations

- NERC should implement a credible, multi-year Tariff Review Path (TRP) that indexes tariff adjustments to a basket of macroeconomic indicators — including inflation, foreign exchange rate, and gas-to-power price — to eliminate the discretionary politicisation of tariff decisions and provide BEDC with a predictable cost-recovery framework.
- The Federal Ministry of Power, in collaboration with the BPE, should renegotiate Performance Agreement benchmarks to align with independently verified capital expenditure trajectories and realistic ATC&C loss reduction curves, rather than retaining the original TFC targets that have been demonstrably unachievable under actual investment conditions.

NERC should strengthen the Eligible Customer Framework to allow large industrial consumers in BEDC's coverage territory to contract directly with GenCos, reducing the DisCo's balance sheet exposure to high-volume accounts while preserving tariff revenue from its residential and commercial base.

B. Operational and Technology Recommendations

- BEDC should accelerate metering penetration to a minimum of 80% by 2028 through an intensified MAP programme, prioritising the Ring-fencing of high-commercial-loss feeders in Warri, Asaba, and Akure urban centres where commercial losses are highest relative to billed energy.
- An Integrated Financial Management System (IFMS) linking billing, collection, payroll, accounts payable, and NBET remittance workflows should be deployed to enable real-time cash flow visibility and evidence-based remittance optimisation.
- BEDC should establish a Revenue Assurance Unit (RAU) modelled on the KPLC Revenue Assurance and Fraud Management (RAFM) function, with dedicated analytical capability for data-driven identification of billing anomalies, meter tampering patterns, and illegal connection hotspots.

C. Strategic and Financial Recommendations

- BEDC's management should pursue revenue diversification through the monetisation of distribution network rights-of-way for broadband fibre-optic infrastructure, and through energy efficiency service agreements with commercial and industrial customers, consistent with its existing NERC licensing authority.
- A structured engagement with the Nigeria Infrastructure Debt Fund (NIDF) and the Africa Finance Corporation (AFC) should be initiated to secure patient, long-tenor capital for network rehabilitation, on terms that do not exacerbate short-term cash flow pressures.

BEDC should commission an independent technical audit of its distribution network by 2026 to produce a prioritised capital expenditure roadmap aligned with loss-reduction impact and return on investment, ensuring that available capital is deployed for maximum financial recovery value.

References

1. Abubakar, A., Adamu, J., & Usman, Y. (2020). Metering gaps and revenue leakage in Nigerian electricity distribution: Evidence from the MAP Regulation. *Journal of Energy Policy and Planning in Africa, 3*(1), 45–67.
2. Aderibigbe, A., Okafor, E., & Salami, T. (2022). Advanced metering infrastructure and commercial loss reduction in sub-Saharan Africa. *Energy for Sustainable Development, 68*, 112–128. https://doi.org/10.1016/j.esd.2022.03.011
3. Aliyu, A. S., Ramli, A. T., & Saleh, M. A. (2013). Nigeria electricity crisis: Power generation capacity expansion and environmental ramifications. *Energy, 61*, 354–367. https://doi.org/10.1016/j.energy.2013.09.011
4. Aminu, M., & Ibrahim, A. (2022). Prepaid metering and collection efficiency in BEDC's service territory: A spatial analysis. *Nigerian Journal of Energy Economics, 7*(2), 88–109.
5. Ayoola, T. (2019). Liquidity cascade in the Nigerian electricity sector: Quantifying the NBET shortfall transmission. *African Development Review, 31*(4), 445–462. https://doi.org/10.1111/1467-8268.12399
6. Bureau of Public Enterprises (BPE). (2013). Technical and financial commitments of electricity distribution companies. Federal Government of Nigeria.
7. Central Bank of Nigeria (CBN). (2015–2024). Annual reports and statistical bulletins. CBN Publications.
8. Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

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9. Eberhard, A., & Gratwick, K. N. (2011). *The privatisation of TANESCO: Background paper for the Tanzania Infrastructure Survey.* Graduate School of Business, University of Cape Town.
10. Eberhard, A., Leigland, J., & Gratwick, K. (2017). *The standard model of utility regulation and its limitations for developing countries.* World Bank Policy Research Working Paper No. 8069.
11. Edomah, N., Foulds, C., & Jones, A. (2016). Energy transitions in Nigeria: The evolution of energy infrastructure provision (1800–2015). *Energies, 9*(7), 484. https://doi.org/10.3390/en9070484
12. Foster, V., & Steinbuks, J. (2009). *Paying the price for unreliable power supplies: In-house generation of electricity by firms in Africa.* World Bank Policy Research Working Paper No. 4913.
13. Gratwick, K. N., & Eberhard, A. (2008). Demise of the standard model for power sector reform and the emergence of hybrid power markets. *Energy Policy, 36*(10), 3948–3960. https://doi.org/10.1016/j.enpol.2008.07.021
14. Hillman, A. J., Withers, M. C., & Collins, B. J. (2009). Resource dependence theory: A review. *Journal of Management, 35*(6), 1404–1427. https://doi.org/10.1177/0149206309343469
15. Ihejirika, P. O., & Nwosu, C. A. (2021). Service-based tariff and revenue optimisation in Nigerian electricity distribution: Evidence from BEDC. *Journal of Public Utilities Management, 14*(1), 22–41.
16. International Monetary Fund (IMF). (2019). *Nigeria: Article IV consultation—Staff report.* IMF Country Report No. 19/92.
17. Iwayemi, A. (2008). Investment in electricity generation and transmission in Nigeria: Issues and options. *International Association for Energy Economics Newsletter, 17*(2), 37–42.
18. Kotler, P., & Keller, K. L. (2016). *Marketing management* (15th ed.). Pearson.
19. National Bureau of Statistics (NBS). (2015–2024). Consumer Price Index reports and GDP rebasing reports. Federal Government of Nigeria.
20. Nigerian Electricity Regulatory Commission (NERC). (2015–2024). Annual market performance reports. NERC Publications.
21. Nigerian Electricity Regulatory Commission (NERC). (2018). *Meter asset provider regulation.* NERC.
22. Nigerian Electricity Regulatory Commission (NERC). (2020). *Order on the service-based tariff framework.* NERC.
23. Nigeria Bulk Electricity Trading Plc (NBET). (2016–2024). Market settlement reports. NBET Publications.
24. Nnaji, B. (2013). *Nigeria's power sector: Privatisation and the roadmap to reform.* Centre for Petroleum, Energy Economics and Law (CPEEL) Distinguished Lecture Series.
25. Obasi, I. (2016). *From NEPA to PHCN to DisCos: Continuity and change in Nigeria's electricity governance.* CLEEN Foundation Working Paper.
26. Okoro, O. I., & Madueme, T. C. (2004). Power system investments in a developing economy. *Journal of Energy in Southern Africa, 15*(4), 26–31.
27. Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence perspective.* Harper & Row.
28. Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organization.* Doubleday.
29. Sterman, J. D. (2000). *Business dynamics: Systems thinking and modeling for a complex world.* McGraw-Hill.
30. Tongia, R. (2007). The political economy of Indian power sector reforms. In D. G. Victor & T. C. Heller (Eds.), *The political economy of power sector reform: The experiences of five major developing countries* (pp. 109–174). Cambridge University Press.
31. Trimble, C., Kojima, M., Perez Arroyo, I., & Mohammadzadeh, F. (2016). *Financial viability of electricity sectors in Sub-Saharan Africa: Quasi-fiscal deficits and hidden costs.* World Bank Policy Research Working Paper No. 7788.
32. Tukur, A., & Musa, A. B. (2021). Smart metering technology adoption in Nigerian distribution companies: Challenges and prospects. *Nigerian Journal of Technology, 40*(2), 317–328. https://doi.org/10.4314/njt.v40i2.19
33. Umeme Limited. (2019). *Annual report and financial statements 2019.* Umeme Ltd.
34. Victor, D. G., & Heller, T. C. (Eds.). (2007). *The political economy of power sector reform: The experiences of five major developing countries.* Cambridge University Press.
35. World Bank. (2021). *Tracking SDG 7: The energy progress report.* World Bank Group.
36. World Bank. (2019). *Nigeria electricity sector recovery programme: Project appraisal document.* World Bank Group Report No. PAD3019.
37. Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

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