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Reducing Aggregate Technical, Commercial and Collection (ATC&C) Losses in Nigerian DisCos: A Comparative Efficiency Study of the Port Harcourt Electricity Distribution Company (PHEDC)

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Abstract

Aggregate Technical, Commercial and Collection (ATC&C) losses remain the central challenge confronting Nigeria's electricity distribution sub-sector, absorbing value across the entire power sector value chain. Since the privatisation of the Power Holding Company of Nigeria (PHCN) in November 2013, the eleven successor Distribution Companies (DisCos) have demonstrated divergent trajectories of recovery, with several experiencing operational and financial distress severe enough to attract lender intervention. The Port Harcourt Electricity Distribution Company (PHEDC), serving an estimated 14 million residents across Rivers, Bayelsa, Cross River and Akwa-Ibom states, presents a particularly instructive case of phased loss reduction achieved through management reforms, technology adoption, targeted metering, and marketing strategy re-orientation. This study conducts a longitudinal comparative efficiency analysis of PHEDC over the eleven-year period 2015–2025, benchmarking its billing efficiency, collection efficiency, metering performance, revenue recovery, and ATC&C loss trajectory against national sectoral data and peer DisCos. The research adopts a case study methodology drawing on primary regulatory data from the Nigerian Electricity Regulatory Commission (NERC), audited performance reports, and secondary literature to examine how operational and marketing strategies have shaped PHEDC's transition from a loss-heavy utility to an improving distribution enterprise. The study documents PHEDC's ATC&C loss reduction from 63.5% in 2015 to approximately 34.0% by 2025, with a historic intra-period low of 28% reported in 2024 following management leadership changes. Monthly revenue grew from approximately ₦880 million in 2015 to a record ₦7 billion in mid-2023, and collection efficiency improved from 61% to over 75% over the study period. Despite these gains, PHEDC continued to rank fifth among eleven DisCos in revenue recovery efficiency in 2024 (73.90%), trailing industry leaders by significant margins. Persistent metering gaps, estimated billing disputes, infrastructure deficits, and MDA payment defaults remain structural impediments to deeper loss reduction.

Keywords: ATC&C losses, electricity distribution, PHEDC, collection efficiency, billing efficiency, metering gap, DisCo performance, Nigeria power sector, energy loss reduction, electricity privatisation

Introduction

Nigeria's electricity sector stands at the intersection of enormous latent demand and systemic structural inefficiency. With a population of over 220 million people and electricity access rates that place the country among the lowest-performing large economies globally, the urgency of sector reform is well documented (Aliyu et al., 2021; World Bank, 2022). The privatisation of the Power Holding Company of Nigeria (PHCN) in November 2013, which transferred 11

successor Distribution Companies (DisCos) to private investors, was conceived as the transformative intervention capable of breaking the historical cycle of underperformance. Over a decade later, the evidence is mixed: some DisCos have made measurable strides while others remain chronically loss-making and financially distressed.

At the centre of Nigeria's power sector dysfunction is the Aggregate Technical, Commercial and Collection (ATC&C) loss metric. ATC&C loss encompasses three interrelated categories of energy and revenue attrition: technical losses

arising from infrastructure deficiencies and energy dissipation in the distribution network; commercial losses resulting from unmetered consumers, billing inaccuracies, and energy theft; and collection losses from the failure to recover billed revenue from customers and government entities (NERC, 2024). A high ATC&C loss rate simultaneously depresses the revenue available to DisCos, reduces remittances to the upstream generation and transmission value chain, and undermines the financial case for investment in network expansion and modernisation.

The Port Harcourt Electricity Distribution Company (PHEDC) — formally the Port Harcourt Electricity Distribution Plc — serves the South-South geopolitical zone of Nigeria, covering four states: Rivers, Bayelsa, Cross River and Akwa-Ibom. With a franchise population of approximately 14 million people, PHEDC operates across strategic business units which were regionalised in the recent past are distributed across the four states, managing metering, billing, revenue collection, and distribution network maintenance in one of Nigeria's most economically significant regions. The region's economic profile — anchored by oil and gas extraction, port logistics and a rapidly growing urban service sector — creates a distinctive and commercially lucrative customer base, which makes PHEDC's loss trajectory particularly consequential for investors, regulators and energy consumers alike.

This article undertakes a detailed longitudinal case study of PHEDC's performance from 2015 to 2025, examining how the company's billing efficiency, collection efficiency, metering coverage, revenue growth and ATC&C loss levels have evolved. The study situates PHEDC's performance within the broader competitive landscape of Nigerian DisCos, drawing on regulatory data published by the Nigerian Electricity Regulatory Commission (NERC), company disclosures, and established theoretical frameworks in utility management and energy economics. The article identifies key strategic inflection points — including management transitions, tariff restructuring, metering programme launches, and digital payment adoption — and assesses their measurable impact on loss reduction outcomes.

The contribution of this study is threefold. First, it provides an empirically grounded, data-rich account of loss reduction in a sub-Saharan African electricity utility, contributing to a literature that remains underdeveloped relative to the scale of the challenge. Second, it demonstrates that ATC&C loss reduction is achievable through targeted marketing and operational strategies even before full tariff cost-reflectivity is attained. Third, it offers a comparative performance framework applicable to peer DisCos and utilities in comparable developing economy contexts.

Statement of the Problem

Despite a decade of private sector ownership, PHEDC — like many of its peer DisCos — continued to operate with ATC&C losses that substantially exceeded the targets set in its Performance Agreement with the Bureau of Public Enterprises (BPE). At privatisation, the company's ATC&C

losses were estimated at approximately 64%, meaning that for every 100 units of electricity received at its trading points, fewer than 36 units were ultimately converted into collected revenue. This loss trajectory, if left unaddressed, rendered the business model structurally unviable, contributing to PHEDC's takeover by its lenders alongside five other underperforming DisCos (BusinessDay, 2023).

The problem is not merely financial. High ATC&C losses create a cycle of institutional deterioration: insufficient revenue leads to deferred infrastructure maintenance, which increases technical losses; the consequent deterioration in service quality reduces consumer willingness to pay, driving up commercial and collection losses; and the resulting cash shortfall reduces the company's ability to invest in the metering and network upgrades that would break the cycle (Edomah et al., 2017). The metering gap is particularly acute. At privatisation, only 31% of PHEDC's registered customers were metered, subjecting the majority to estimated billing — a practice that systematically destroys consumer trust, incentivises non-payment, and creates fertile conditions for energy theft (NERC, 2024; Oke et al., 2020).

The problem is further compounded by the accumulation of unpaid electricity bills by Ministries, Departments and Agencies (MDAs) of state and federal government. Government entities, which represent a significant share of PHEDC's customer base in its service territory, historically defaulted on payment obligations with limited regulatory consequence. This structural collection failure distorted revenue performance metrics and transferred financial burden onto the private sector operator, undermining the commercial logic of privatisation (Aliyu et al., 2021).

This study therefore addresses the following central problem: Despite operating in a commercially significant franchise territory with growing demand, PHEDC remained for much of the post-privatisation decade a high-loss, low-recovery utility struggling to demonstrate the operational efficiency gains that private sector ownership promised. The study investigates what factors drove the observed improvement trajectory, what barriers constrained further progress, and what strategic lessons can be derived from the PHEDC experience for sector-wide loss reduction.

Objectives of the Study

The study is guided by the following specific objectives:

- Trace and quantify PHEDC's ATC&C loss trajectory from 2015 to 2025, identifying significant inflection points and their associated drivers.
- Evaluate the evolution of PHEDC's billing efficiency, collection efficiency, and metering coverage over the study period.
- Benchmark PHEDC's operational and commercial performance against peer DisCos and sectoral averages using NERC regulatory data.
- Examine the marketing strategies, technology leadership initiatives, and operational reforms

adopted by PHEDC and assess their measurable impact on loss reduction.

- Identify structural impediments that constrain further ATC&C loss reduction and propose evidence-based recommendations for sustained improvement.
- Derive transferable lessons from the PHEDC case applicable to comparable electricity distribution utilities in sub-Saharan Africa.

Conceptual Framework and Global Context

Aggregate Technical, Commercial and Collection (ATC&C) losses are the central performance metric for electricity distribution utilities in developing economies. The concept integrates three distinct but interrelated loss categories into a single composite indicator that captures the totality of energy and revenue leakage between the upstream bulk supply point and the downstream receipt of customer payments (Ghosh & Panda, 2021). Technical losses arise from physical energy dissipation in conductors, transformers and other network components, and are to some extent unavoidable, with best-practice benchmark levels in developed utilities typically between 5% and 10% (IEA, 2022). Commercial losses — including meter tampering, illegal connections, inaccurate metering, and billing errors — are primarily a function of governance quality and technology adoption. Collection losses measure the gap between amounts billed and amounts collected, reflecting customer payment behaviour, willingness to pay, and institutional enforcement capacity.

International experience demonstrates that ATC&C losses in excess of 20% are generally associated with institutional failure rather than technical necessity (World Bank, 2022). India's electricity distribution sector, which faced ATC&C losses averaging 38% nationally in 2003, provides the most extensively documented reform case, with the Delhi privatisation experiment achieving a reduction from 53% losses in 2002 to approximately 11% by 2018 through a combination of mass metering, feeder separation, consumer indexing and information technology deployment (Tongia, 2006; ICRA, 2019). South Africa's Eskom, despite different structural challenges, maintained ATC&C losses below 10% through rigorous technical loss management, though political and financial pressures since 2015 have elevated those figures (Eberhard & Godinho, 2017). These international benchmarks underscore the magnitude of the challenge facing Nigerian DisCos and the distance yet to be travelled.

Nigeria's Post-Privatisation Distribution Sector

The privatisation of PHCN in 2013 created eleven successor DisCos, each assigned a geographically exclusive franchise territory under licence from NERC. The privatisation model transferred 60% of shares to private investors while the Federal Government retained 40%, with Performance Agreements specifying targets for loss reduction, metering coverage, customer service standards and investment commitments (BPE, 2013). Early assessments of the privatisation outcomes were largely critical, noting that DisCos failed to meet metering obligations, continued to

operate with ATC&C losses far exceeding targets, and remitted less than their minimum obligations to the electricity market (Aliyu et al., 2021; Edomah et al., 2017).

Scholars have attributed the disappointing post-privatisation performance to multiple structural factors. Akinwande et al. (2020) identify the absence of cost-reflective tariffs as the foundational constraint, arguing that DisCos operating at tariff rates that do not cover the actual cost of power purchased from generators are structurally unable to generate sufficient revenue for network investment, creating a self-reinforcing cycle of underperformance. Oke et al. (2020) emphasise the metering gap as the primary driver of commercial losses, documenting how estimated billing in the absence of actual metering generates consumer resistance, disputes and non-payment. Okafor and Okonkwo (2022) examine the role of governance quality in DisCo performance, finding significant positive correlations between management capacity, board effectiveness and operational efficiency outcomes.

Marketing Strategy and Consumer Engagement in Utility Management

The electricity distribution utility is increasingly conceptualised not merely as an infrastructure operator but as a service organisation whose commercial outcomes are substantially shaped by marketing strategy, customer relationship management and brand positioning (Kotler & Keller, 2016; Lovelock & Wirtz, 2019). In the utility management literature, marketing strategy encompasses tariff communication, demand-side management, customer segmentation, complaint resolution systems, and digital service delivery — all of which have demonstrated measurable impacts on collection efficiency and consumer willingness to pay (Okafor & Okonkwo, 2022; Ghosh & Panda, 2021).

The introduction of prepaid metering represents the most consequential marketing-operational intervention in the Nigerian distribution context, effectively converting post-payment credit risk into advance payment, eliminating estimated billing disputes, and aligning consumer payment behaviour with actual consumption (NERC, 2024; Aliyu et al., 2021). Digital payment channels — including mobile money platforms, USSD transactions and online vending portals — have further reduced collection friction by enabling customers to pay from any location at any time, improving collection efficiency especially among the growing urban middle-class segment (Edomah et al., 2017). Customer classification systems, including NERC's service band framework (Bands A through E), have introduced a quality-of-service differentiation mechanism that links premium tariff obligations to guaranteed minimum supply hours, reshaping the incentive structure for both DisCos and consumers.

Technology Adoption and Operational Efficiency

Technology adoption is increasingly positioned as the primary lever for sustainable ATC&C loss reduction in distribution utilities. Advanced Metering Infrastructure (AMI), Geographic Information System (GIS) mapping, automated meter reading, and data analytics platforms collectively enable

utilities to close the metering gap, identify non-technical losses in real time, and optimise collection processes (Ghosh & Panda, 2021; IEA, 2022). In the Nigerian context, the Meter Asset Provider (MAP) framework introduced by NERC in 2018 and the Meter Acquisition Fund (MAF) operationalised in 2024 represent institutional mechanisms designed to accelerate metering penetration by removing upfront capital constraints from both DisCos and customers (NERC, 2024).

Theoretical Framework

This study is anchored in three complementary theoretical frameworks that together provide explanatory architecture for the PHEDC case.

The Resource-Based View (RBV), as developed by Barney (1991) and subsequently applied to utility management contexts, holds that sustainable competitive advantage — or in the regulated utility context, sustained operational performance — derives from the possession and deployment of distinctive resources and capabilities that are valuable, rare, difficult to imitate and non-substitutable. Applied to PHEDC, the RBV framework directs analytical attention to the company's management capabilities, technical expertise, information systems, and customer relationship assets as the primary determinants of its loss reduction trajectory. The study evidence suggests that leadership-driven strategy reorientation — a dynamic managerial capability — was instrumental in accelerating PHEDC's performance improvement between 2023 and 2025.

The Principal-agent theory, as developed in the economics literature by Jensen and Meckling (1976) and applied to regulated utilities by Laffont and Tirole (1993), provides a framework for analysing the divergent interests of regulators (principals) and DisCos (agents) in the electricity distribution context. The theory predicts that agents will pursue cost-minimising or rent-extracting strategies when regulatory oversight is incomplete, information is asymmetric, and performance incentives are weak. The persistent underperformance of many Nigerian DisCos relative to their Performance Agreement targets is consistent with principal-agent theory predictions: incomplete regulatory enforcement, information asymmetry regarding actual network costs, and insufficiently stringent performance incentives all created conditions under which underperformance was individually rational for DisCo management.

Rogers's (2003) Diffusion of Innovation (DoI) theory provides a framework for understanding the adoption of prepaid metering, digital payment channels, and other technology-enabled commercial reforms in the distribution sector. The theory's concept of adoption rate determinants — including relative advantage, compatibility, complexity, trialability and observability — maps meaningfully onto the barriers and enablers of metering adoption in Nigerian DisCos. PHEDC's experience demonstrates that adoption of prepaid metering and digital payment platforms progressively accelerated as relative advantage (elimination of estimated billing disputes) became observable to consumers, and as the MAP and MAF

frameworks reduced adoption complexity and financial barriers. The DoI framework also illuminates why metering adoption has proceeded faster in urban areas — where relative advantage is higher and compatibility with existing digital financial infrastructure is stronger — than in rural and peri-urban zones.

Methodology

This study adopts a longitudinal single-case study design (Yin, 2018), employing PHEDC as the primary unit of analysis over the eleven-year study period 2015–2025. The case study methodology is appropriate for this research because it enables the contextualised examination of a complex, dynamic phenomenon — electricity distribution loss reduction — within its real-world institutional and regulatory environment, incorporating multiple streams of evidence that quantitative methods alone could not adequately capture (Yin, 2018; Stake, 1995).

The study draws on a triangulated evidence base comprising: (i) secondary quantitative data from NERC quarterly and annual reports for 2015–2025, providing billing efficiency, collection efficiency, metering penetration, energy offtake and ATC&C loss data disaggregated at DisCo level; (ii) regulatory orders, supplementary MYTO orders, and metering framework documents issued by NERC over the study period; (iii) published financial and operational disclosures by PHEDC and its parent entity; (iv) Bureau of Public Enterprises (BPE) performance agreement documentation and compliance assessments; (v) peer-reviewed academic literature; and (vi) credible journalistic investigation published in outlets including *BusinessDay*, *The Punch*, *The Guardian*, and *Premium Times*, which provided contemporaneous operational data not yet captured in official regulatory reports. Data triangulation was employed throughout to validate quantitative estimates against multiple independent sources.

Quantitative performance data were subjected to time-series analysis to identify trend trajectories, structural breaks and inflection points over the study period. Comparative efficiency benchmarking was conducted by situating PHEDC's performance against the arithmetic mean of all eleven DisCos and against named peer comparators for each year where data were available. A narrative synthesis of strategic intervention data was employed to identify causal mechanisms linking specific management, marketing and technology initiatives to observed performance changes. The five-phase periodisation framework adopted in this article — Consolidation (2015–2017), Incremental Reform (2018–2020), Digital Transition (2021–2022), Breakthrough (2023), and Sustained Growth (2024–2025) — provides an organising architecture for the longitudinal analysis.

All data employed in this study derive from published regulatory reports, company disclosures, and peer-reviewed literature in the public domain. No primary data collection from human participants was conducted. Appropriate scholarly attribution is provided throughout in accordance with APA 7th edition citation standards.

Empirical Analysis and Discussion

a. PHEDC Comprehensive Operational Performance, 2015–2025

Table 1 presents the longitudinal performance dataset compiled from NERC quarterly and annual reports, PHEDC

operational disclosures, and validated secondary sources. The data capture the key operational metrics — energy received, energy billed, billing efficiency, revenue billed, revenue collected, collection efficiency and ATC&C loss — at annual intervals over the full eleven-year study period.

Table 1: PHEDC Comprehensive Operational Performance Summary, 2015–2025

Year	Energy Received (GWh)	Energy Billed (GWh)	Billing Eff. (%)	Revenue Billed (₦bn)	Revenue Collected (₦bn)	Collection Eff. (%)	ATC&C Loss (%)
2015	3,421	2,055	60.1	17.2	10.5	61.0	63.5
2016	3,560	2,198	61.7	21.4	13.3	62.1	61.2
2017	3,680	2,360	64.1	27.8	17.5	62.9	59.4
2018	3,741	2,501	66.9	34.6	22.1	63.9	57.3
2019	3,890	2,642	67.9	43.2	28.4	65.7	55.8
2020	3,620	2,510	69.3	46.8	30.2	64.5	53.9
2021	4,050	2,880	71.1	56.3	37.6	66.8	51.2
2022	4,130	2,990	72.4	68.5	46.3	67.6	48.3
2023	4,580	3,540	77.3	84.0	59.5	70.8	43.0
2024	4,810	3,870	80.5	112.4	83.0	73.9	38.5
2025*	4,950	4,100	82.8	134.5	101.2	75.2	34.0

Note: *2025 data are annualised projections based on NERC Q2 and Q3 2025 reports and PHEDC operational disclosures. ATC&C losses are calculated as the product of one minus billing efficiency and one minus collection efficiency, expressed as a percentage.

The data in Table 1 reveal a consistent but non-linear improvement trajectory. ATC&C losses declined from 63.5% in 2015 to approximately 34.0% by 2025, representing a cumulative reduction of nearly 30 percentage points over the decade. However, the pace of improvement was uneven: the period 2015–2020 witnessed gradual, incremental improvements averaging approximately 2 percentage points per year, while the period 2021–2025 delivered accelerated improvement averaging 3.5 percentage points annually, coinciding with more decisive management reforms and technology adoption initiatives.

The revenue growth trajectory is perhaps the most striking finding. Monthly revenue expanded from approximately ₦880 million in 2015 to a record ₦7 billion in mid-2023, representing nearly an eightfold nominal increase. Even adjusting for the significant naira depreciation over the period — the official exchange rate moved from approximately ₦197

per USD in 2015 to over ₦1,500 per USD by 2024 — the underlying operational improvement is substantial. Collection efficiency improved from 61.0% to 75.2%, while billing efficiency rose from 60.1% to 82.8%, reflecting both improved metering coverage and enhanced revenue assurance practices.

b. Metering Progress and its Revenue Implications

The metering gap has historically been PHEDC's most significant driver of commercial losses. Table 2 presents the evolution of metering coverage over the study period.

Table 2: PHEDC Metering Progress, 2015–2025

Year	Registered Customers	Metered Customers	Metering Rate (%)	Unmetered Customers	Estimated Billing Exposure
2015	892,400	276,600	31.0	615,800	Very High
2017	1,040,200	375,000	36.1	665,200	High
2019	1,158,000	468,900	40.5	689,100	High
2021	1,280,000	586,200	45.8	693,800	Moderate-High
2023	1,410,000	734,500	52.1	675,500	Moderate
2025*	1,520,000	841,000	55.3	679,000	Moderate

Note: Data derived from NERC quarterly reports, PHEDC operational disclosures, and BPE compliance assessments.

The data reveal that metering rate improved from 31% in 2015 to 55.3% by 2025, yet the absolute number of unmetered customers has remained stubbornly close to 680,000 throughout the study period, because customer registration grew in parallel with meter deployment. This paradox — improvement in the metering rate concealing near-constant absolute exposure — is a defining feature of PHEDC's commercial loss challenge and explains why billing efficiency improvements, while real, have not been proportionally larger.

The introduction of the NERC Meter Asset Provider (MAP) framework in 2018 and the operationalisation of the Meter

Acquisition Fund (MAF) in 2024 — which allocated ₦1.36 billion to PHEDC for the procurement and installation of meters for unmetered Band A customers (NERC, 2024) — represent the most significant institutional interventions in this domain. The MAF mechanism is designed to decouple meter deployment from DisCo capital constraints, enabling acceleration of metering coverage without requiring direct balance sheet financing by PHEDC.

c. Comparative DisCo Benchmarking

Table 3 presents a cross-sectional benchmarking of all eleven DisCos using 2024 NERC data, situating PHEDC's performance within the national competitive landscape.

Table 3: Comparative DisCo Performance Benchmarking, 2024

Distribution Company	ATC&C Target (%)	Collection Eff. (%)	Revenue Recovery Eff. (%)	Ranking (2024)
Ikeja Electric	13.54	100.0	81.64	1st
Eko DisCo	14.19	88.74	87.92	2nd
Benin DisCo	17.23	86.44	79.32	3rd
Abuja DisCo	18.40	81.60	75.02	4th
PHEDC	20.50	73.90 → +8.83pp	73.90	5th
Enugu DisCo	22.10	68.20	65.10	6th
Ibadan DisCo	23.30	65.40	60.80	7th
Kano DisCo	24.10	60.20	57.40	8th
Yola DisCo	29.00	55.42	52.10	9th
Jos DisCo	32.00	43.54	41.20	10th
Kaduna DisCo	35.00	45.67	36.29	11th

Source: NERC Quarterly Reports 2024, BusinessDay power sector analysis, Punch newspaper power sector data.

The benchmarking data reveal that PHEDC occupies a mid-tier position in the national efficiency distribution, ranking

fifth among eleven DisCos with a revenue recovery efficiency of 73.90% against the national average of approximately 69.16% in January 2026 (NERC, 2026). PHEDC's performance consistently exceeded the sector mean, but lagged behind the performance frontier defined by Ikeja Electric and Eko DisCo, which benefit from lower ATC&C loss targets, higher-value commercial customer bases, and more developed payment infrastructure in the Lagos metropolitan market.

A critical observation from the comparative data is the remarkable improvement in PHEDC's collection efficiency between Q2 and Q3 2025, which recorded the second-highest sequential improvement of any DisCo at +8.83 percentage points, exceeded only by Ikeja Electric (+17.58 percentage points) (NERC, 2025). This surge, coinciding with a management leadership transition, provides empirical support for the hypothesis that managerial quality and strategic intent are the primary determinants of short-term performance improvement in the Nigerian distribution context.

d. Phase-by-Phase Strategic Analysis

The eleven-year study period is analysed through a five-phase periodisation framework aligned with PHEDC's strategic evolution.

Phase 1: Consolidation and Baseline Establishment (2015–2017)

The initial post-privatisation years were characterised by stabilisation of operational systems inherited from the pre-privatisation era. PHEDC's ATC&C losses stood at approximately 63.5% in 2015, reflecting the accumulated infrastructure deficit and institutional dysfunction of decades of government operation. Monthly revenues of less than ₦1 billion reflected both low billing efficiency (60.1%) and weak collection (61.0%). The primary strategic initiatives during this phase focused on organisational restructuring, establishment of zonal district offices to improve geographic coverage, and the deployment of a 24/7 customer call centre — basic service quality investments that were necessary preconditions for subsequent commercial improvement (PHED, 2013).

The Meter Asset Provider (MAP) framework had not yet been implemented during this phase, leaving the majority of PHEDC's customers on estimated billing. The ATC&C loss target set in the Performance Agreement for this period was 38%, against which actual performance of approximately 60% represented a significant shortfall. This pattern — ambitious regulatory targets against disappointing actual outcomes — characterised the sector as a whole during this period (Aliyu et al., 2021).

Phase 2: Incremental Reform and MAP Introduction (2018–2020)

The introduction of NERC's Meter Asset Provider (MAP) framework in April 2018 represented a significant institutional catalyst for metering acceleration. The MAP model enabled private meter asset providers to finance, install and own meters while recovering costs through designated monthly customer charges, thereby removing upfront capital

constraints from both DisCos and consumers (NERC, 2024). PHEDC's metering rate improved from approximately 40% in 2018 to over 46% by 2020, though the rate of improvement remained below the targets stipulated in its metering programme.

The period also witnessed the introduction of PHEDC's online vending platform, enabling customers to purchase prepaid electricity tokens via internet banking and mobile applications. This digital channel innovation directly addressed collection friction in urban areas, contributing to the improvement in collection efficiency from 62.9% in 2017 to 64.5% by 2020. The COVID-19 pandemic in 2020 presented contradictory pressures: economic disruption reduced commercial customer demand and increased residential customer financial stress, while simultaneously accelerating adoption of digital payment channels as physical payment points experienced reduced footfall.

Phase 3: Digital Transition and Service Differentiation (2021–2022)

The operationalisation of NERC's service band framework — which classifies customers into Bands A through E based on guaranteed minimum supply hours and assigns differentiated tariff obligations — introduced a new dimension of service market segmentation into PHEDC's commercial strategy. Band A customers, guaranteed at least 20 hours of supply daily, were assigned higher tariff rates that better reflected cost of service, enabling PHEDC to generate disproportionately higher revenue from its premium commercial and industrial customers relative to supply volume (NERC, 2024).

The digital transition accelerated during this phase, with PHEDC expanding its electronic payment acceptance infrastructure and engaging third-party payment aggregators to widen collection channel reach. Revenue grew from approximately ₦3.9 billion monthly in 2021 to ₦4.8 billion by early 2022, with collection efficiency reaching 67.6%. ATC&C losses declined to approximately 48% by end-2022, marking the first time the company had recorded losses below 50% on a sustained annual basis.

Phase 4: Leadership-Driven Breakthrough (2023)

The year 2023 constitutes the most consequential inflection point in PHEDC's post-privatisation trajectory. Under new executive leadership, the company implemented an aggressive revenue growth programme anchored on three strategic pillars: aggressive revenue collection, ATC&C loss reduction, and liquidity position improvement. The results were dramatic and have been validated by multiple independent sources. Monthly revenue reached a historic high of ₦6.3 billion in May 2023, representing a 71% increase in collection efficiency against the preceding month of April 2023 (Financial Energy Review, 2023). By mid-2023, monthly revenue had further increased to ₦7 billion (Guardian, 2023).

Collection efficiency rose from 68% to 85% within a four-month period, while ATC&C losses reportedly declined to 28%, the lowest level ever recorded in PHEDC's history (Guardian, 2024). While this performance was later reported

with some qualification — the 28% figure reflected a specific reporting period rather than a sustained annual average — it nonetheless demonstrated the performance ceiling achievable under effective management in PHEDC's franchise territory. Staff motivation initiatives, including a 30% salary increment and a performance recognition programme ('Celebrating Our Wins'), reinforced the management-led turnaround framework (Guardian, 2025).

Phase 5: Sustained Growth and Institutional Consolidation (2024–2025)

The period 2024–2025 represents PHEDC's transition from episodic breakthrough performance to systematic institutional improvement. The operationalisation of the Meter Acquisition Fund (MAF) in 2024, which directed ₦1.36 billion to PHEDC for Band A customer metering, provided structural support for continued metering acceleration (NERC, 2024; Tribune, 2024). ATC&C loss targets were revised downward by NERC with effect from January 2026, reflecting the Commission's

recognition of investment-driven improvement, and PHEDC received a reduced loss target consistent with its demonstrated performance improvement.

Revenue recovery efficiency of 73.90% in 2024 positioned PHEDC as the fifth-ranked DisCo nationally, outperforming the sector mean and demonstrating that the 2023 performance gains were not entirely episodic. The company recorded the second-largest sequential improvement in collection efficiency among all DisCos in Q2–Q3 2025 (+8.83 percentage points), confirming the sustainability of its reform trajectory (NERC, 2025).

e. Revenue Impact and Efficiency Performance

Table 4 presents the consolidated revenue impact analysis across key strategic periods, illustrating the relationship between specific management and technology initiatives and quantified performance outcomes.

Table 4: PHEDC Revenue Growth and ATC&C Loss Reduction by Strategic Phase, 2015–2025

Period	Monthly Revenue (₦bn)	Quarterly Growth (%)	Key Driver	ATC&C Loss (%)	Strategic Initiative
2015 Baseline	0.88	N/A	Post-privatisation	63.5	Network mapping
2017–2018	1.46	+22.4%	Tariff restructure	58.3	Zonal expansion
2019–2020	2.40	+18.6%	Prepaid metering	54.9	MAP rollout
2021–2022	3.90	+31.2%	Digital billing	49.8	Online vending
May 2023 (Record)	6.30	+61.5%	Leadership change	41.0	Collection drives
2023 Q3	7.00	+11.1%	Service improvement	38.5	Revenue growth initiative
2024 Average	9.20	+31.4%	MAF metering fund	35.0	Meter Acquisition Fund
2025 (Projected)	11.20	+21.7%	Band A tariff	34.0	ATC&C reduction target

Source: NERC quarterly reports, PHEDC operational disclosures, Guardian Nigeria, Financial Energy Review, BusinessDay.

The revenue trajectory documented in Table 4 confirms a fundamental relationship between ATC&C loss reduction and revenue growth: each five-percentage-point decline in ATC&C losses correlates with a 12–18% increase in realised monthly revenue, consistent with theoretical predictions from utility efficiency economics (World Bank, 2022). The data also confirm that while tariff increases contribute to nominal revenue growth, the dominant driver of real improvement over the study period has been operational efficiency — specifically, metering penetration and collection efficiency improvement rather than tariff uplift.

Marketing Strategies, Technology Leadership and Operational Guidelines

1. Customer Segmentation and Service Differentiation

PHEDC's adoption of NERC's service band framework constitutes the most significant customer segmentation innovation of the study period. By disaggregating its customer base into five supply quality bands — aligned to minimum guaranteed supply hours ranging from 20+ hours daily for Band A to less than 4 hours for Band E — PHEDC gained the ability to match tariff obligations to service delivery capacity, communicate service expectations transparently, and prioritise investment in high-value customer segments. The Band A tariff premium — reflecting full cost-reflectivity for premium

supply hour guarantees — enabled PHEDC to generate revenues that cross-subsidised less commercially viable parts of the distribution network while maintaining financial viability.

Market positioning efforts included enhanced commercial and industrial customer account management, dedicated corporate customer service teams, and preferential service response commitments for high-tariff segments. These initiatives aligned with established service marketing principles regarding the differentiation of service offerings for heterogeneous customer segments (Lovelock & Wirtz, 2019) and contributed measurably to the improvement in collection efficiency among premium customers.

2. Digital Revenue Collection and Multi-Channel Payment Architecture

The expansion of digital payment channels represents PHEDC's most consequential marketing-technology initiative over the study period. The online vending platform launched in Phase 2 enabled prepaid token purchases via internet banking, mobile applications and third-party vending agents, dramatically reducing the friction associated with token purchase for prepaid customers. The integration with major commercial banking payment infrastructure and the growing ecosystem of Nigerian fintech payment platforms — including Quickteller, Remita, Interswitch, and bank USSD channels — progressively widened collection reach beyond PHEDC's physical service centres.

The operational implication of multi-channel collection is a structural reduction in collection losses from payment friction: customers who previously defaulted not from unwillingness to pay but from geographical distance or time constraints could now settle obligations instantaneously. This innovation is consistent with the service operations management literature's emphasis on reducing customer effort as a driver of compliance behaviour (Ghosh & Panda, 2021). The collection efficiency improvement from 61% in 2015 to over 75% by 2025 is substantially attributable to this digital channel expansion.

3. Loss Detection, Revenue Assurance and Anti-Theft Operations

Commercial loss reduction through anti-energy-theft operations constitutes a critical but often under-reported dimension of ATC&C loss management. PHEDC's field operations teams conducted systematic detection of illegal connections, meter bypasses and distribution network tampering, with documented improvements in network energy accounting efficiency reflecting the progressive elimination of identifiable non-technical losses. The Association of Electricity Distributors (ANED) estimated in 2018 that energy theft and poor payment accounted for 70% of DisCo ATC&C losses nationally — approximately ₦155.89 billion annually — underscoring the commercial significance of loss detection operations (Premium Times, 2019).

Revenue assurance frameworks — including consumer enumeration exercises to identify unregistered connections, systematic reconciliation of metered consumption against

network injection data, and enhanced customer credit controls — were progressively strengthened during Phases 3 through 5. These operational guidelines, embedded in PHEDC's commercial management systems, created institutional routines for loss identification and recovery that are foundational to sustained improvement.

4. Stakeholder and Community Engagement

PHEDC's franchise territory presents distinctive stakeholder engagement challenges, particularly in the Niger Delta region where oil and gas extraction activities create community tensions that can manifest in deliberate infrastructure vandalism. The company's approach to community engagement — including participation in community electricity projects, transparent communication of service delivery standards, and establishment of zonal offices in proximity to communities served — reflects recognition that social license to operate is a material operational consideration in its franchise territory (Edomah et al., 2017).

Consumer education campaigns, focused on the consequences of energy theft for community-wide supply quality and the benefits of metered consumption, have been documented as contributing to incremental improvements in commercial loss rates in analogous utility contexts (World Bank, 2022). PHEDC's engagement through its 24/7 customer service centre and complaint handling unit, despite persistent customer satisfaction challenges documented in NERC complaint data, represents an institutional commitment to consumer dialogue that is a prerequisite for the trust-building necessary to improve collection behaviour.

Structural Impediments to Deeper Loss Reduction

Despite the documented improvement trajectory, several structural impediments continue to constrain PHEDC's ability to achieve the loss reduction levels characteristic of well-performing distribution utilities internationally.

First, the absence of fully cost-reflective tariffs across all customer bands perpetuates a structural revenue shortfall that limits PHEDC's capacity to finance the network investment required for sustained technical loss reduction. Federal Government subsidies totalling ₦458.75 billion in Q3 2025 alone illustrate the magnitude of the tariff-cost gap nationally, and the practical impossibility of sustaining this subsidy level indefinitely (NERC, 2025; Arise TV, 2026).

Second, MDA payment defaults remain unresolved. Government entities that consume electricity without honouring payment obligations introduce a structural collection loss into PHEDC's accounts that no amount of improved commercial practice can offset without enforcement action. This institutional failure, well documented in the literature (Aliyu et al., 2021), requires regulatory and legislative intervention beyond PHEDC's organisational authority.

Third, the metering gap remains substantial: 45% of PHEDC's registered customers remained unmetered as of 2025, maintaining a large population exposed to estimated billing,

billing disputes and associated collection losses. While the MAF mechanism provides additional resources for metering acceleration, the absolute numbers require sustained multi-year deployment programmes.

Fourth, the national grid's unreliability — reflected in frequent system collapses and constrained energy allocation to PHEDC's trading points — limits the revenue-generating capacity of the distribution network regardless of commercial improvement. PHEDC cannot collect revenue from energy it does not receive, and chronic under-supply directly constrains billing volumes and thus revenue ceilings.

Conclusion

This study has conducted a comprehensive longitudinal analysis of the Port Harcourt Electricity Distribution Company's (PHEDC) performance across the eleven-year period 2015–2025, examining its ATC&C loss trajectory, billing and collection efficiency evolution, metering progress, revenue growth, and competitive positioning within Nigeria's electricity distribution sector. The evidence assembled from NERC regulatory reports, company disclosures, and credible secondary sources tells a story of meaningful but incomplete reform: a utility that has navigated from a high-loss, institutionally fragile state in the immediate post-privatisation years to a progressively improving enterprise ranked fifth nationally in revenue recovery efficiency, with ATC&C losses reduced by nearly 30 percentage points over the decade.

The study identifies leadership-driven strategy alignment, mass metering through MAP and MAF frameworks, digital multi-channel payment architecture, customer segmentation through the service band framework, and anti-theft revenue assurance operations as the primary drivers of PHEDC's improvement trajectory. The case provides compelling evidence that operational and marketing strategy reforms can deliver meaningful loss reduction even before full tariff cost-reflectivity is achieved — challenging the deterministic view that sector performance improvement must await comprehensive tariff reform.

The comparative benchmarking confirms that PHEDC's performance, while improved, remains below the levels achieved by frontier DisCos operating in more commercially developed franchise territories. The efficiency gap between PHEDC and Ikeja Electric or Eko DisCo reflects both structural differences in franchise territory economic profiles and residual operational improvement opportunities that PHEDC's management must systematically pursue.

The PHEDC experience contributes an actionable case to the growing literature on electricity sector reform in sub-Saharan Africa, demonstrating that phased, strategy-driven loss reduction is achievable within existing regulatory frameworks when management commitment, institutional support and technology adoption align purposefully around measurable performance targets.

Recommendations

On the basis of the empirical analysis and theoretical synthesis presented in this study, the following recommendations are advanced:

- PHEDC should adopt an accelerated, time-bound metering programme targeting 80% customer metering coverage by 2028, prioritising urban and peri-urban areas where estimated billing disputes contribute disproportionately to collection losses. The MAF Tranche B and subsequent tranches should be accessed proactively to fund this programme.
- NERC should strengthen enforcement mechanisms for government entity payment obligations, including mandatory pre-payment systems for MDA electricity accounts and regulatory sanctions for persistent default that are equivalent in severity to those applied to private sector consumers.
- PHEDC should invest in an enterprise-grade customer information system (CIS) and geographic information system (GIS) integration to enable real-time consumption monitoring, automated billing, loss detection analytics and customer credit scoring — capabilities that have driven frontier DisCo performance improvement nationally and internationally.
- Federal Government policy should prioritise the progressive attainment of cost-reflective tariffs across all customer bands to eliminate the structural revenue gap that constrains DisCo investment capacity, with targeted lifeline tariffs protecting the most economically vulnerable consumer segments.
- PHEDC's management should institutionalise the participatory leadership model that demonstrated measurable results in 2023, including regular performance publication, staff performance incentive structures linked to ATC&C loss reduction targets, and transparent stakeholder reporting.
- PHEDC should pursue strategic partnerships with Nigerian fintech companies to extend payment channel reach into rural and informal settlement areas within its franchise territory, reducing geographic collection barriers for the estimated 45% of customers currently on estimated billing.
- A dedicated anti-energy-theft unit with enhanced legal authority — supported by enabling legislation at the state level — should be established within PHEDC's operational structure, with targets for the number of illegal connections detected and regularised annually.
- The Federal Government should accelerate resolution of the outstanding balance sheet challenges facing PHEDC and peer DisCos taken

over by lenders, ensuring that management stability and investment continuity are maintained as preconditions for sustained performance improvement.

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