Review Article *Open Access*

Journal of Scientific Engineering Advances

ISSN: 3071-0723

DOI: *doi.org/10.63721/26JSEA0121*

Financial Performance of South African Municipal Electricity Utilities: Addressing Variances Effectively

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Citation: Shandukani Tshilidzi Thenga (2026) Financial Performance of South African Municipal Electricity Utilities: Addressing Variances Effectively. J. of Sci Eng Advances 2(1) 1-09. WMJ/JSEA-121

Abstract

Electricity trading is a critical revenue source for South African municipalities, enabling cross-subsidisation of basic services, debt repayment, and infrastructure financing, which is essential for sustainable municipal operations. Nevertheless, municipal electricity utilities consistently experience variances between budgeted and actual financial performances due to increasing Eskom bulk tariffs, technical and non-technical losses, a degrading distribution system, billing malpractices, and governance breakdown, thereby threatening service delivery sustainability. This paper examines the financial performance of four major distributors—City of Ekurhuleni, City of Cape Town, City Power (Johannesburg), and City of Tshwane—using a mixed documentary research approach, ensuring comprehensive sectoral analysis. Data sources include audited municipal financial statements, National Energy Regulator of South Africa (NERSA) tariff materials, Auditor-General findings, and national electricity statistics, supplemented by secondary literature on distribution losses and utility governance as well as international best practices. Key performance measures point out that an increase in bulk electricity cost and restricted variations in tariffs have enhanced trading limits, electricity theft, meter tampering, and billing inaccuracies, leading to massive revenue leakages, significantly undermining financial stability. The lack of investment in the maintenance of assets also increases such long-term costs. The paper recommends a set of five strategic interventions to be implemented, such as better revenue management, non-technical loss reduction, recovery of the infrastructure that is ring-fenced, transparent cost-reflective tariffs, and governance and institutional controls. A sequenced implementation framework entails the short-term protection of revenue, the medium-term deployment of smart meters, and the long-term reforms of assets. The findings emphasise that sustainable improvement requires integrating operational reform, technological advancement, financial discipline, and governance enhancement.

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Submitted: 29.01.2026 **Accepted:** 02.02.2026 **Published:** 15.02.2026

Keywords: Municipal Electricity Utilities, Financial Performance, Non-Technical Losses, Revenue Protection, Smart Metering, Tariff Governance, Asset Management, Municipal Finance, South Africa, Electricity Distribution

Introduction

In South African metropolitan and district municipalities, electricity trading is one of the most strategically critical sources of revenue. Electricity sales are consistently one of the main sources of operating income for local governments, meaning that a municipality can cross-subsidise other critical services, outstanding responsibilities and debt repayments, in addition to funding capital investment programmes [1]. However, despite the importance of electricity revenue, many municipal electricity departments face significant variances between budgeted and actual financial performance as a result of increasing bulk purchase prices charged by Eskom, high rates of technical and non-technical losses, poor infrastructure, billing errors, poor revenue collection, poor governance and long-standing audit deficiencies [2,3]. These factors place significant pressure on the financial sustainability of municipalities and destabilise the reliability of the electricity supply. In this study, four targeted electricity distributors will be subjected to financial analysis, the City of Ekurhuleni, the City of Cape Town, City Power and the City of Tshwane, in addition to some secondary municipal distributors, so as to examine the key drivers of financial variance and a package of evidence-based interventions. A detailed diagnostic framework and a timetabled roadmap are provided to stabilise municipal financial performance and reverse negative variances in the short, medium and long term by triangulating municipal financial statements, national statistical datasets, the literature on the topic and the regulatory framework.

Scope and Data Sources (Methods)

This paper is presented in a mixed documentary research form, incorporating both primary and secondary data. Primary sources included the municipal audited financial statements and integrated annual reports of the City of Ekurhuleni, City of Cape Town and City of Tshwane [4-6]. NERSA tariff-setting documents, municipal tariff filing documents, and national electricity statistics publications and consolidated Municipal Finance Management Act (MFMA) audit results from the Auditor-General [2,7]. The secondary analytical information sources consisted of development finance ratings [8], South African Local Government Association (SALGA) sector studies and comprehensive reports on electricity distribution losses, asset-management difficulties, and revenue-collection performance [9-11].

The triangulation of these datasets allowed for cross-checking of financial indicators, operational performance indicators and institutional factors that influence municipal electricity performance. The overlap between empirical municipal data and the literature at large provides a firm basis on which the underlying causes of variances can be diagnosed and through which actionable interventions can be identified.

Key Performance Indicators Used

The metrics used as key performance indicators in this analysis are based on the metrics regularly used in MFMA audits and municipal financial evaluations, as reported in the Auditor-General's consolidated reports [2]. These include electricity revenue trends, such as year-on-year revenue growth, tariff adjustments and the rising cost of bulk electricity purchases due to pricing adjustments by Eskom. Financial stability is also further represented by gross margins from electricity trading, collection rates from consumers and the size of outstanding debt. Technical and non-technical losses as a percentage of energy purchased are used to provide information about operational efficiency, and operating surpluses or deficits are an indicator of the overall fitness of electricity services. Long-run sustainability is measured using the expenditure of capital on network maintenance, renovation and equipment replacement. Lastly, the strength of financial management is reflected in the governance and audit results, such as irregular or unauthorised expenditure and compliance with MFMA controls. Taken together, these indicators allow for consistent assessment across municipalities and enable detection of areas that show serious operational, financial or governance strain.

Literature Synthesis—Causes of Variances and International Context

It is necessary to analyse domestic and international studies and perform regulatory and sectoral analyses to understand drivers of variances in municipal electricity finances. Subsequently, we identified recurrent trends and priorities that negate institutional electricity performance, with an emphasis on structural, operational and governance aspects. By doing so, this analysis places the experience of South African municipalities in a wider global framework, providing information on the causes of variances and the strategic priorities required to enhance financial resilience and performance efficiency.

Structural Pressures

The greatest structural problem is that the steady increase in Eskom bulk electricity tariffs is often higher than the rate at which municipalities are capable of amending their retail tariffs because of political and regulatory limitations [12,13]. This misalignment squeezes trading margins, limits cash flow to reinvestment and introduces imperviousness to municipal budgeting mechanisms. Similar experiences in other countries show that when faced with high upstream energy prices, especially when limited by political or regulatory action, utilities experience similar financial volatility, causing margins to be lost when cost-reflective pricing is constrained [14].

Operational Drivers

Another important contributor to variances is operational inefficiencies, mainly high distribution losses. Non-technical losses (NTL), including electricity theft, unauthorised connections, compromised meters and inappropriate billing, contribute to high revenue leakage and accumulate over time [9-11]. Existing infrastructure, faulty metering, and unpredictable billing regimes only add to these losses, thus reducing the predictability and efficiency of revenues. According to the international literature, utilities with weak loss-management programmes and outdated networks are likely to experience financial issues sooner, highlighting the extent of operational dependability worldwide [15,16].

Governance and Institutional Factors

Fiscal variances are also increased by deficiencies in governance. Lack of internal control, irregular auditing, procurement irregularities and unreconciled municipal departmental accounts demonstrate close relations with low financial performance [2,17]. Poor financial planning and unreliable expenditure management undermine accountability and limit access to the concessional finances needed to fund important infrastructural upgrades. By extension, negative audit results are not only an indicator of weak institutions but also hinder the municipal implementation of long-term technical and fiscal solutions.

Strategic Priorities Identified in the Literature

Two shared strategic priorities are apparent in the domestic and international literature. First, strong revenue management is essential, including accurate metering, reliable billing systems, rigorous collection procedures, and targeted forensic actions against illegal connections [18,19,10]. Second, technical losses should be minimised through targeted investment in distribution assets management and preventing equipment breakdowns in advance, which implies a guaranteed reinvestment of surplus electricity revenue to maintain the reliability of the network and guarantee its financial sustainability in the long run [8,14]. In combination, these priorities take both operational and financial variances into account and can thus be used to strengthen municipal electricity facilities.

Diagnostic Findings from the Four Focal Municipalities

A review of municipal financial reports, regulatory returns and national datasets demonstrates multiple endemic pressures undermining the electricity trading performance of the four municipalities analysed. Firstly, pressures on bulk electricity costs have been mounting and squeezing margins, with municipal tariffs adjusting very slowly in comparison with rising Eskom prices. In the first six months of 2023, municipalities spent a total of South African Rand (ZAR) 50.2 billion on bulk electricity and earned ZAR 60 billion in sales revenue—a reportedly modest overall surplus that conceals great differences between municipalities [7]. The continued restructuring process and weak financial health of Eskom have increased the volatility of the municipal cost base [13,20].

Secondly, collection performance and growing debts are significant issues, with a number of municipalities reporting significant increases in outstanding consumer receivables. For example, the City of Tshwane has a strong service-charge collection system yet faces a

growing number of debtors, which restricts liquidity and affects the ability to meet operational requirements [6]. Trends identified in Auditor-General South Africa (AGSA) reports show that these poor collection rates are linked to unauthorised and irregular expenditure, highlighting the overall systemic consequences of ineffective revenue management [2].

Thirdly, distribution losses and non-technical losses remain major causes of fiscal variance. Municipal audits and academic studies on the subject highlight the deep-rooted operational issues of illegal connections, meter tampering, load-limiting bypasses and fraudulent billing [10,11]. Pilot programmes, like City Power's theft analytics, suggest that a real decrease in NTL is achievable, but only with the application of long-term enforcement and consolidation with working practices.

Municipal electricity distribution is vulnerable to financial strains due to underinvestments in maintenance and capital expenditures (CAPEX). Many municipalities prioritise immediate budgetary pressures by postponing vital network renewal and maintenance, increasing technical losses, frequency of outages and overall replacement costs [21,8]. Though Cape Town and Ekurhuleni have comparatively more intensive CAPEX allocations, the overall scope of the network renewal required is extensive and constrained by liquidity rates [4,5].

In addition, financial resilience is significantly influenced by governance and audit reports. Revenue protection and operational efficiency are compromised by weak internal controls, inconsistency in expenditure patterns and procurement lapses. Ekurhuleni exhibits comparatively well-structured governance bodies, while other municipalities are still affected by poor audit results, demonstrating the importance of regulation in streamlining municipal electricity funds [2,6].

Synthesis: Critical Focus Areas to Address Variances

An analysis of the literature and the municipalities studied reveals five key areas of concern influencing variances in performance. Enhanced revenue-management systems are still fundamental, and require proper metering, effective billing, automated data analytics and disciplined collection methods [10,11]. It is also critical to minimise non-technical losses through investigating relevant cases, collaborating with the community, and using sophisticated analytical tools [18,19]. It is crucial to make surplus electricity reserves available for reinvestment in order to preserve distribution assets and avoid long-term network degradation [8,14]. Municipalities should also be required to improve controls on tariffs using cost-reflective prices as per NERSA guidelines [12]. Lastly, governance standards and audit readiness, especially with regard to procurement controls and reduced irregular expenditure, should be improved to enhance financial integrity and general municipal performance [2,17].

Evidence-Based Interventions (Operational, Technical, Financial, Governance)

Rapid Revenue-Protection Package (0–12 Months)

An expedited revenue protection response is essential as a means of stabilising income flow in at-risk municipalities. This package must comprise strengthened debtor control, instant replacement of meters in high-loss areas, and active enforcement against unlawful connections. The experience of international utilities demonstrates that within months, substantial revenues may be recovered, with priority given to high-loss feeders on the condition of their facilitation and community-oriented enforcement practices [9]. Key aspects include the creation of a Revenue Protection Unit with conferred legal power, which would allow a municipality to regularise consumption and act where needed [18]. Prepaid and remotely readable meters need to be encouraged in high-loss regions. Research shows that automated meter reading (AMR) and analytics based on Advanced Metering Infrastructure (AMI) can greatly lower NTL, provided they are used in conjunction with plausible enforcement [16].

Data-Driven Theft Detection and Smart-Meter Rollouts (1–3 Years)

Implementation of smart-meter technology, along with machine learning-assisted detection of theft, is a medium-term solution for sustainable variance reduction. Deep learning devices, including those discussed in [22,19], are highly accurate in detecting suspicious usage patterns in AMI datasets. Each municipality should focus on feeders with the highest aggregate loss while ensuring that the operational teams are

well-trained to deal with cases identified by analytics engines. Sequenced rollouts can ensure quantifiable non-technical loss reductions and an increase in billing accuracy.

Asset Management and Ring-Fenced Reinvestment (1–5 Years)

Municipalities must embrace systematic asset-management systems that comply with global best practices to deal with infrastructural depressions over time. Enhancing the ring-fencing of electricity excesses would ensure that the money is saved to refurbish networks instead of being channelled towards general operating expenditures. As noted by development finance institutions such as the Development Bank of Southern Africa [10], capital expenditure (CAPEX) budgets should be safeguarded to ensure minimal technical losses and disastrous equipment breakdowns.

Tariff Governance and Transparent Cost-Reflective Pricing

Transparent tariff establishment, as recommended by NERSA, is essential to maintaining utility margins. Cost-reflective tariffs need not compromise social equity; with well-constructed lifeline tariffs and specifically targeted subsidies, vulnerable households are not negatively impacted, while financial sustainability remains achievable [12]. Improved tariff administration also reduces complexity and enhances predictability for consumers and urban planners.

Financial Restructuring and Credit-Linked Support

Municipalities with acute liquidity constraints, especially those with outstanding debts to Eskom, must arrange repayment schemes while considering credit-based assistance through the Development Bank of Southern Africa and other financing agencies. International guidance, such as the Organisation for Economic Co-operation and Development (OECD) reports [14] and analyses by Reuters [20], propose setting fiscal discipline with targeted investments to avoid medium-term losses.

Governance, Audit Readiness and Procurement Reform

The basis of any successful fiscal recovery is through continual advancements in internal controls, management and audit responsiveness. On many occasions, the Auditor-General has mentioned that municipalities with strong internal controls show greater electricity trading results and resilience [2]. There is therefore a need to address recurrent audit findings to minimise variances and open up financing for future investments.

Implementation Roadmap

Phase 1—Immediate (0–6 Months)

The first six months of implementation should focus on municipalities protecting their revenue streams as quickly as possible to stabilise cash flow and reduce the sectors that pose the highest risks. This approach requires the creation of special Revenue Protection Units (RPUs) with the operational and legal powers to perform check reconciliations at the feeder level, explore consumption trend aberrations, and issue compliance actions. Municipalities can address the most important revenue leak rates through informal settlements, namely high-loss feeders and residential clusters, to maximise the immediate financial effect [15]. At the same time, emergency replacement of meters (e.g., prepaid and remotely readable meters) and the installation of temporary advanced metering infrastructure (AMI) gateways can stabilise revenue streams much faster and decrease susceptibility to tampering or bypass [23].

Phase 2—Short to Medium Term (6–24 Months)

Smart-metering and data-driven theft detection should become the operational norm for municipalities during the 6–24-month phase. AMI should be installed on priority feeders, which will be connected to machine-learned algorithms capable of detecting cases of consumption anomalies, possible illegal connections, and tampering [12]. In combination with these technical remedies, municipalities should formalise ring-fencing policies to guarantee that redundant electricity trading reimbursement revenues go towards network upkeep and capital expenses (CAPEX) and are not diverted to ordinary operating costs. At this stage, the availability of concessional finance through the DBSA can help deliver network renewal projects faster and increase infrastructure resilience, which will, in turn, mitigate future technical losses.

Phase 3—Medium to Long Term (2–5 Years)

In the medium and long run, it is recommended that

municipalities roll out AMI implementation to the full grid, complete full transformer and feeder upgrades and deploy more sophisticated asset-management platforms to streamline network performance and forecast maintenance needs. The tariff framework also needs to be redesigned to ensure cost-reflectivity, where prices correspond to the real cost of supply without compromising social protection targets for vulnerable consumers [22]. At this point, the convergence of good infrastructure, data-based monitoring and sustainable economic policies is likely to mitigate non-technical losses, stabilise revenues, and ensure long-term fiscal sustainability for municipalities' electricity utilities.

Key Performance Indicators

To evaluate the effectiveness of interventions, municipalities should track the following set of quantitative and qualitative indicators:

- Non-technical loss reduction is computed monthly using the ratio of energy purchased, which provides a direct measure of the effectiveness of theft prevention measures and operational efficiency [9].
- Revenue collection performance, including the collection rates and days sales outstanding (DSO) of electricity receivables, is an indicator of a municipality's efficiency in converting consumption into liquid cash flow [7].
- CAPEX utilisation and backlog reduction are tracked by comparing expenditure with ring-fenced surpluses, as well as the progress made in reducing deferred maintenance and network renewal; this tracking guarantees effective use of financial resources to improve reliability and offset long-term costs [8].
- Governance and audit results demonstrate the prevalence and severity of findings in relation to electrical activity, such as irregular or unauthorised expenditure; the results reflect how much the internal controls, compliance measures and transparency reinforce the financial stability of municipalities [2].

By combining operational, technical and financial interventions with continuous monitoring of the above indicators, municipalities can attain measurable loss reduction, stabilise revenue streams and establish a viable long-term baseline of electricity service delivery. Table 1 presents the implementation roadmap with corresponding key performance indicators for each phase.

Table 1: Implementation Roadmap and Key Performance Indicators.

Phase	Timeline	Key Activities	Key Performance Indicators (KPIs)
Phase 1—Immediate	0–6 Months	Establish Revenue Protection Units (RPUs) with legal and operational authority	NTL reduction (% of energy purchased)
		Conduct feeder-level reconciliations	Initial improvement in collection rates and DSO
		- Deploy emergency metering teams (prepaid & remotely readable meters)	Early identification of irregular/unpaid accounts
Install temporary AMI gateways in high-loss feeders			
Phase 2—Short to Medium Term	6–24 Months	Deploy smart meters on prioritised feeders	Reduction in NTL for targeted feeders
		Integrate fraud-detection algorithms into operations	Collection rates and DSO improvements
		Implement ring-fencing policies for electricity surpluses	CAPEX utilisation vs. ring-fenced surpluses
		Access concessional financing from DBSA for CAPEX	Early audit findings improvement

Phase 3—Medium to Long Term	2–5 Years	Scale AMI across the entire municipal grid	Sustained NTL reduction across the network
		Complete transformer and feeder upgrades	Stabilised collection rates and reduced arrears
		Implement advanced asset-management platforms	CAPEX fully aligned with network renewal plan
		Review tariff-setting frameworks for cost-reflectivity and social protection	Improved governance and reduced irregular/un-authorised expenditure

Limitations and Risks

A number of risks may limit the implementation of the proposed approach. Political–economic barriers can hinder progress, especially through opposition to enforcement and changes in tariffs [24]. Financial resources are also a hindrance to the expansion of Advanced Metering Infrastructure and infrastructure renewal; thereby, phased rollouts and clear performance evaluations are absolute necessities in order to secure outside funding [8]. Social risks should also be carefully managed: forced implementation in conditions where affordability feedback is lacking can increase household difficulties. This risk can be reduced with the use of focused subsidies and lifeline tariffs [24].

Conclusions

The combination of short-term revenue-protective strategies, medium-term analytics-based non-technical loss mitigation and long-term investment in distribution infrastructure can help decrease South African municipal electricity variances significantly. Institutional support for sustainable financial recovery can be provided through enhanced tariff governance, strengthened audit readiness and ring-fenced reinvestment. Prioritising high-loss feeders, capitalising on advanced analytics and protecting social interests will enable municipalities to stabilise revenues, reduce losses and ensure financial strength, allowing them to offer quality electricity services.

Author Contributions

Single author contribution: S.T.T. is the sole author and conducted all aspects of this research, including conceptualisation, methodology, formal analysis, investigation, writing—original draft preparation, writing—review and editing. The author has read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Data Availability Statement

The data used in this study were obtained from publicly available sources, including audited municipal financial statements, NERSA regulatory documents, Auditor-General consolidated reports, and Statistics South Africa publications. All sources are cited in the references section. No new primary data were generated during this research.

Conflicts of Interest

The author declares no conflicts of interest.

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