Vuthela

ILEMBE LED PROGRAMME

CASE STUDY 3

Preventing revenue losses through electricity provision

February 2023

Schweizerische Eidgenossenschaft
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Preface

It's 10.30pm on a cold winter night on the north coast of KwaZulu-Natal.

A technician from the local municipality's electricity department is driving his 4-wheel drive truck through remote dusty roads, stopping only to confirm his location on his mobile phone.

The municipality was plunged into darkness early in the evening as the load on the electricity supply network increased. Shortly afterwards, the technician was despatched to inspect substations along the supply line and fix the fault.

The expenditure in fuel, time and effort is enormous: many other technicians are also driving around their districts trying to locate faults as the demand for electricity for heating soars above the capacity of the network.

As the night gets colder, more and more substations in the region fail. Meanwhile, residents are sitting in the dark or using candles, huddled in blankets around wood-burning fires.

Hours later, as the sun is about to rise, the faulty switchgear is finally located. The technician conveys the information to the repair team, who set off to the storage yard to locate a replacement for transportation to the substation and installation.

When power to consumers is eventually restored, it is already well past noon.

Business owners and operators are frustrated - they have lost valuable hours of productive work. Residents also feel let down.

The municipality's reputation for service delivery is at risk.

Now fast forward to the future...

The Vuthela iLembe LED Support Programme has commissioned the design of a Supervisory Control and Data Acquisition (SCADA) system.

The Vuthela Programme has helped the municipality to secure finances from the National Treasury General Budget Support Fund provided by the European Union (EU), and the SCADA system has been installed.

The system connects every substation on the electricity feeder lines to a central control room at the KwaDukuza Local Municipality.

As soon as the power supply is interrupted, a technician monitoring a bank of screens in the control room locates the affected substation and identifies the faulty equipment within it.

Repair teams are dispatched with the correct replacements within a few minutes.

The electricity supply is up and running quickly. The faith of the business community and residents in the municipality's capacity for efficient service delivery is restored and its reputation is enhanced.

What makes all this possible is a remarkable cable-free system which makes the best use of digital monitoring and communication technology.

When a fault occurs on the supply line, monitors placed throughout the network pick it up immediately, locate it precisely using the radio network, and report it to the control room – within a fraction of a second of the fault taking place.

The system also allows the municipality to monitor the precise amount of electricity available and to determine exactly how much is being used in real time, making it possible to manage the distribution of electricity and avoid power outages.

The SCADA system calculates technical measurements of the network's performance and records the information on a database in the control room – every minute of every day, every day of the year.

Now, the many vehicles that would have been driving through the night searching for faults are parked off.

Only one or two technicians are at work – they are monitoring the screens at the control room, waiting for the signal of a fault to come to them.

Introduction

The Mandeni and KwaDukuza Local Municipalities are developing the capacity to improve the reliability of their electricity supply through a pioneering initiative.

The electricity network in both municipalities was analysed in detail as part of the Vuthela iLembe LED Support Programme, leading to the creation of a system which uses cutting edge digital technology to monitor and control the entire network from a single control room.

This case study outlines the process of creating the system and describes its capabilities.

The three sections of the case study cover the definition, causes and extent of non-revenue electricity; initiatives to reduce the losses; and the development of a Supervisory Control And Data Acquisition (SCADA) system that enables municipalities to provide a secure and stable electricity supply.

The case study ends with a summary of lessons learnt in the execution of this project.

The development of the SCADA system at KwaDukuza Local Municipality is a lasting legacy of the Vuthela Programme.

The system will bring enormous economic and social benefits for decades into the future when it is fully operational.

The Vuthela Programme aims to improve the economic future of iLembe district residents through sustainable economic growth of the local economy, including initiatives to create higher, better and more inclusive employment and income-generating opportunities.

The programme consists of five components:

- Public Finance Management (PFM)
- Municipal Infrastructure (MI)
- Private Sector Development (PSD)
- Building Inclusive Growth (BIG)
- Partnerships and Coordination (P&C)

This case study about non-revenue electricity falls under the Municipal Infrastructure Component whose focus is to improve planning and access to infrastructure services for development investment, effective and efficient service delivery, and sustainable growth. The study focuses on improving operations and efficiencies in electricity services provided by the KwaDukuza and Mandeni Local Municipalities.

It complements a parallel study conducted by the Vuthela Programme into how the iLembe District Municipality can recover lost revenue from water supplied.

Put together, the additional revenue that municipalities can accrue from both water and electricity through more efficient systems can support improved service delivery levels for these and many other essential services.

The insights and learnings gained from this case study should be of value to municipalities and practitioners dealing with the challenges of a stable power supply and non-revenue electricity.

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Section 1: What's the fault?

At stake: R415 million lost over three years

The Auditor-General's reports to the KwaZulu-Natal provincial legislature for the KwaDukuza Local Municipality over the past three years include a short section titled "Material losses – electricity".

It tells a worrying story: losses incurred through the supply of electricity which has not been paid for is costing the municipality millions of rands in lost revenue every year.

Even more concerning is that the extent of the losses is increasing steadily every year, with no end in sight. Now, revenue for about one fifth of all the electricity supplied by the municipality is lost.

If this trend is not reversed urgently, the municipality could find that escalating losses are undermining its capacity to continue providing energy services and are exerting a negative impact on its ability to provide other essential services.

Here are the relevant sections from the AG's report for KwaDukuza Municipality under "Material losses – electricity":

2018 - 2019

"... material electricity losses of R115,1 million were incurred, which represents 18,05% of the total electricity purchased. Technical losses were due to transmission and distribution losses while non-technical losses were mainly due to illegal connections..."

2019 - 2020

"... material electricity losses of 137 297 168 kWh amounting to R152,56 million were incurred, which represents 20,94% of total electricity purchased. The losses were due to transmission and distribution losses and illegal connections..."

2020 - 2021

"... electricity losses of 153 728 734 kWh amounting to R181,21 million were incurred, which represents 22,82% of total electricity purchased. The losses were due to transmission or distribution losses and illegal connections..."

How lost energy depletes the budget

Energy losses are described as energy which municipalities have bought from Eskom and supplied, but which have not been paid for by consumers, leaving a gap between what has been bought and what is being sold.

These energy losses include technical and non-technical losses. Technical losses occur naturally in the network and are caused by the dissipation of power in electrical system components such as transmission lines and power transformers.

Meters and other equipment designed to measure power usage also use a small portion of the electricity they are measuring. Most technical losses can be calculated and controlled.

On average, electricity utilities throughout the world typically experience technical losses of about 4-10% of the total amount of electricity

which flows through their distribution systems.

Non-technical losses occur when electricity is consumed, either legally or illegally, but is not accurately recorded, billed and paid for.

Examples of non-technical losses

1. Unknown or unmetered connections: in some cases, a prepaid or conventional meter is installed, but the information of the meter has not been recorded in the municipality's financial system. Failure to record essential information in the financial system can normally be attributed to administrative errors in the application or installation process.
2. Faulty meters: when a meter gets stuck and stops recording power consumption due to a faulty internal mechanism, the user is consuming energy legally, but does not get billed due to the meter not registering the correct consumption.
3. Meter tampering: when a user illegally tampers with a meter by bypassing the meter completely or making the meter run slower than it should, only a portion of the consumption or no consumption is recorded, leading to consumers paying less or nothing at all for the electricity they consume.
4. Ghost vending: in some cases, syndicates are selling prepaid electricity to consumers, but the consumption does not register on the municipality's official system. It has been found that syndicates have devised a way to "mimic" the official system so that the revenue from the prepaid vouchers does not go to the municipality but to the syndicate. This has become a national challenge as syndicates using similar methods have been uncovered in many municipalities across South Africa.

How much loss is too much?

Non-technical losses occur on the commercial side of a municipality's business and are also termed "commercial losses".

If left unchecked, non-technical losses can quickly escalate out of control, leaving municipal budgets for service delivery in disarray.

The World Bank Group benchmark for total losses (technical and non-technical) for a medium to large municipality is 11% of the total electricity supplied. The National Energy Regulator of South Africa (NERSA) benchmark for losses is also 11%.

If technical losses in any municipality are around 4%, then non-technical losses should not exceed 7% in that municipality, according to the benchmark.

In South Africa, many municipalities exceed the 11% benchmark by a considerable margin - and in most cases, non-technical losses are the biggest contributor. At the same time, non-technical losses can be reversed more readily, providing low-hanging fruit for urgent interventions.

High losses place a burden on municipalities as the revenue generated from electricity sales may not even cover their costs of purchasing the electricity from bulk suppliers like Eskom.

Increasing the tariff for electricity is not a solution to the problem of non-revenue electricity. The NERSA has compliance requirements which prevent unapproved tariff increases. It would also be unfair for paying customers to foot the bill for non-paying customers, whether they are doing so legally or not.

Municipalities therefore need to have comprehensive management plans in place to address energy losses and subsequent losses in revenue from energy sales.

Section 2: What's the fix?

The Vuthela Programme launched the Non-Revenue Electricity Strategies & Programmes (NRESP) project to assist the KwaDukuza and Mandeni Local Municipalities to reduce their non-revenue energy.

Every municipality in South Africa is unique, although many face similar challenges.

While it is not possible for a solution in one municipality to be transplanted in its entirety to another, there are some overall principles which can be modified for application at another electricity services provider.

An in-depth analysis was conducted to gain a thorough understanding of each municipality's situation through a process of stakeholder workshops and studying various reports, drawings as well as billing and metering data.

Four main aspects of the electricity supply process were analysed during this process:

- Existing infrastructure assessment – a study of the condition and composition of the existing network, purchasing of bulk supply from Eskom, institutional arrangements in place to manage these processes and management systems in place to support these processes.
- Technical losses assessment – analysis of current processes in place to calculate these losses, measures to determine where they occur and their causes.
- Non-technical losses assessment – verifying the quality and compliance of financial systems and supplementary systems in use, the quality of data in the systems, and the quality and extent of revenue collection for electricity supplied.
- Community engagement and end-user campaigns – understanding the extent of processes in place to engage with the community, campaigns to make the community aware of their responsibility to pay for the services they receive, the dangers and consequences of tampering with or stealing electricity, and where members of the community can report issues ranging from faulty meters to incidents of electricity theft or other criminal activity which undermines revenue collection.

The analysis process was aimed at identifying strategies to curb losses and reduce them to international standards, while improving the revenue from electricity sales for the municipalities. Existing initiatives from each municipality were incorporated to represent consolidated strategies, programmes and management plans for each municipality.

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At Mandeni...

Electricity consumption in the town of Mandeni was found to be stable.

Mandeni Local Municipality receives its bulk supply of electricity from Eskom via a single 11kV overhead line. This means that there is no firm capacity for the supply of electricity.

The internal network is arranged as a ring feeder, with part of the town supplied at 11kV and part at 6.6kV. Two step-down transformers manage the difference in capacity between the two unmatched parts of the internal network.

The internal 11kV and 6.6kV networks are sufficient for current capacity in the contingency state, which is when one component is out of service. However, the additional impedance of the 11kV to 6.6kV transformers results in voltage regulation levels on the 6.6kV network which exceed SANS 507 norms.

Assessment of the current network led to the recommendation to upgrade all 6.6kV equipment so that the entire internal network for Mandeni operates on a single reticulation voltage of 11kV.

This recommendation was based on the condition of the 6.6kV equipment as well as considerations of the operational and technical losses incurred through the mismatched systems and abnormal performance of the network due to the transformers that must be used.

The upgrade is estimated to cost over R18 million.

When implemented, these projects will ensure a secure and stable electricity network, which will support all other initiatives designed to unlock economic growth in the municipality of Mandeni.

At KwaDukuza...

The KwaDukuza Local Municipality buys its electricity from Eskom and resells it to customers within its licensed area.

KwaDukuza's 33kV distribution substations supply 11kV switching stations, miniature sub-stations, and ground and pole-mounted trans-formers through 11 kV network feeders. The 11kV switching substations supply additional miniature substations and transformers as well as large power users (LPUs), in some instances at 11kV.

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The miniature substations and transformers then supply reticulation zones which carry the electricity directly to customers.

The 33kV lines and cables are in fair condition with minimal failures over time and are adequately sized for the current network load. The 11kV lines are upgraded on a yearly basis based on assessments of the condition of sections of the line as part of the KwaDukuza Local Municipality MV Upgrade Projects.

The KwaDukuza distribution networks have been in service for many years and much of the network is aged but is still functional.

Such networks tend to exhibit degradation in reliability, performance, and functional inadequacy.

An assessment of NERSA data indicates that total losses are constantly on the increase, raising concerns for municipal officials: the NERSA benchmark for total losses is 11% of electricity supplied, but KwaDukuza Local Municipality is sadly on its way to incur losses which are almost double the benchmark.

The table below depicts the impact of possible additional review, if KwaDukuza Local Municipality was able to reduce its losses and achieve the benchmark of 11%:

	2018/2019	2019/2020	2020/2021
NERSA benchmark 11% total losses	74,229,006	72,121,200	72,810,425
Additional sales	45,826,974	65,175,968	69,135,496
Annual average selling price per unit	R 1.4225	R 1.6279	R 1.6826
Potential additional revenue at benchmark losses	R 65,188,870.74	R 106,099,957.72	R 116,327,385.12

KwaDukuza Local Municipality currently experiences technical losses in the distribution of electricity in the order of between 6% and 8%, according to the Electrical Engineering Services estimate. The estimated technical losses for the northern and southern regions were estimated to be 6% and 8% respectively.

Distribution losses at KwaDukuza Local Municipality for the 2018/2019 financial year amounted to 18.05% of the total electricity supplied. This includes both technical and non-technical losses.

This means that the municipality lost revenue estimated at over R115 million for the 2018/2019 financial year, and the revenue for just under one-fifth of the electricity supplied did not accrue to the municipality.

To address this challenge, the Vuthela Programme appointed Zutari consultants to assist the municipalities of KwaDukuza and Mandeni to reduce their energy losses and improve revenue from providing electricity services.

Specific strategies were developed to suit the unique needs identified in each of the two local municipalities.

The proposed strategies were classified into:

- Technical strategies
- Financial strategies
- Institutional strategies
- Social Interventions and Initiatives strategies

Strategies were also prioritised in terms of the following:

1. Quick wins.
2. Available funding.
3. Technical capacity of each municipality.

Each strategy included information about the following aspects:

- Basic high-level scope of work.
- Estimated resources.
- Funding options.
- Provision of SMART implementation schedules for the short, medium, and long term.
- Risks and appropriate mitigation measures
- Innovative procurement and implementation options.

These strategies were presented to municipal officials at stakeholder workshops, and the strategy documents were circulated for comments and review and were also presented to each municipality's Management Committee (MANCO).

The strategies proposed for each municipality are indicated in the following tables:

KwaDukuza Local Municipality

Description	Category
Eskom POS (Point of Sale) metering assurance	Technical
Ensure all LPU (large power user) customers are on metering systems	Technical
Technical and non-technical losses separation	Technical
Implementation of SCADA System and Control Centre phases 1-3	Technical
Electrification and prepaid metering of informal settlements	Technical
LPU customer audits and consumption verification	Financial
Bulk metering of stands with multiple prepaid meters	Financial
SPU (small power user) customer metering / vending assurance	Financial
Review of credit control processes & activities	Financial
Intra- and interdepartmental Standard Operating Procedures enhancement	Institutional
Tariff study and review	Institutional
Implementation of KwaDukuza Municipality CRM* system	Institutional
Implementation of single platform iLembe Indigent Management System	Institutional
Implementation of Data Warehousing and Business Intelligence platforms	Institutional
Establishment of Revenue Protection Unit	Institutional
Community engagement	Social

*Customer Relations Management

Mandeni Local Municipality

Description	Category
Eskom POS Metering assurance	Technical
Technical and non-technical losses separation	Technical
Upgrade of 6.6kV networks to 11kV	Technical
Eskom billing administration	Financial
Prepaid customer vending assurance	Financial
Conventional customer billing assurance	Financial
Review of credit control processes and activities	Financial
Intra- and interdepartmental Standard Operating Procedures	Institutional
Tariff study and review	Institutional
Implementation of single platform iLembe Indigent Management System	Institutional
Implementation of Data Warehousing and Business Intelligence Platform	Institutional
Independent review of NERSA D forms	Institutional
Community engagement	Social

Short-term interventions that could reap immediate benefits for the municipalities were also identified. These included:

- Eskom tariff review for Mandeni Local Municipality:

  During the analysis process it was discovered that Mandeni Local Municipality was on an Eskom tariff that leads to the municipality paying more per giga Watt hour (GWh) of electricity than the metros. The municipality has been assisted with a draft letter to query this tariff with Eskom with the aim of moving to a tariff structure that is more suitable to its needs.

- LPU consumption audits for KwaDukuza Local Municipality:

  Experience has shown that one of the best examples of a quick win is to review the consumption patterns of LPUs. The LPU customers need to be on Automated Meter Reading (AMR) so that their hourly consumption patterns can be reviewed, instead of monthly reviews only. The reasoning behind this is that meters could develop technical faults when a fuse blows, meter mechanisms fail or when customers tamper with meters illegally. The short-term intervention of auditing the consumption patterns of at least 120 LPU customers at KwaDukuza Local Municipality could lead to the recovery of approximately R12 million of lost revenue, with a return on investment of over 600% for the exercise.

The project provided a “roadmap” for the two municipalities to implement and reduce non-revenue energy to acceptable levels.

These reports form the basis of actions to be undertaken and are broken down into:

- Specific time frames for the various interventions to assist in planning for implementation.
- Cost estimates per intervention to assist with budget planning and the allocation of funds.
- An inter-dependency matrix, as some interventions depend on others to ensure that all work together to achieve the desired outcome.

The ultimate goal of the various strategies which have been proposed is to ensure multi-pronged approaches for each municipality which will allow it to:

- Reduce expenditure on the supply of electricity.
- Improve revenue from electricity services provided.
- Improve service quality and reliability of supply to consumers.
- Ensure the sustainability of its electricity services.

Why electricity theft must be reduced:

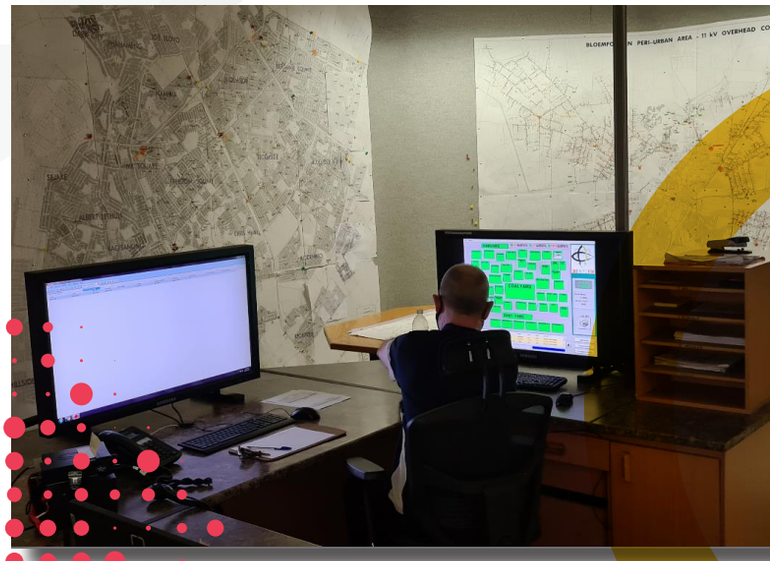
- Unlawful connections are not safe and endanger the health of the person installing the unlawful connection and the public.
- People use energy excessively because it is perceived to be 'free'.
- Municipalities lose extensive revenue which undermines their capacity for service delivery.
- It is costly to remove and re-instate networks which have been damaged due to tampering, vandalism and illegal connections.

How to deter energy theft:

- Install split metering units with active units in kiosks.
- Install vandalism protected equipment like protected locks and aluminium conductors.
- Increase security measures at sites where possible.

How to reduce losses due to metering errors:

- Complete monthly audits on all points of supply to confirm the accuracy of the metering.
- Complete monthly audits on the billing process to confirm accurate and timeous billing.



Section 3:
SCADA puts eyes on the prize

What is a SCADA?

"A Supervisory Control And Data Acquisition system monitors the energy supply infrastructure in real time for switching operations, outages and load conditions and transmits the information to a central point from which the entire network can be remotely monitored."

As part of the Vuthela Programme, a functional specification for the establishment of a SCADA system and Control Room to control and manage electrical services in the KwaDukuza Local Municipality was developed.

The purpose of the specification was to ensure that the SCADA system was suitably designed to ensure safe, reliable operation and was simple to maintain.

The SCADA system configuration and the related equipment necessary for the complete installation, was detailed in this design specification and technical data sheets.

The Vuthela Programme assisted the KwaDukuza Local Municipality to secure funding through the National Treasury/European Union (EU) General Budget Support Programme to finance the acquisition and installation of the SCADA. KwaDukuza subsequently appointed a consultant for the review, verification, compilation of tender document and construction project management. The contract to install the system went out for tender and after some delay due to pricing variance, it was awarded and initiated in September 2022.

The SCADA system will allow for remote monitoring of the electricity supply infrastructure and control of key elements within the infrastructure. It will provide critical information about the status and performance of the electrical system in real time and generate a series of customised user reports.

This information, especially the statistical metering data, is crucial in conducting assessments of technical losses as it provides an accurate measure of the loading on the network at any given time. It allows network operators to assess the maximum demand and the load profile on the network.

Phase 1 of the project will include installing monitoring and communication equipment at all major distribution substations in the supply network.

Phase 2 will include the 36 key switching substations and Phase 3 will include a smart metering system which will measure the power flowing through the feeder lines and the 1 405 reticulation transformers in the network.

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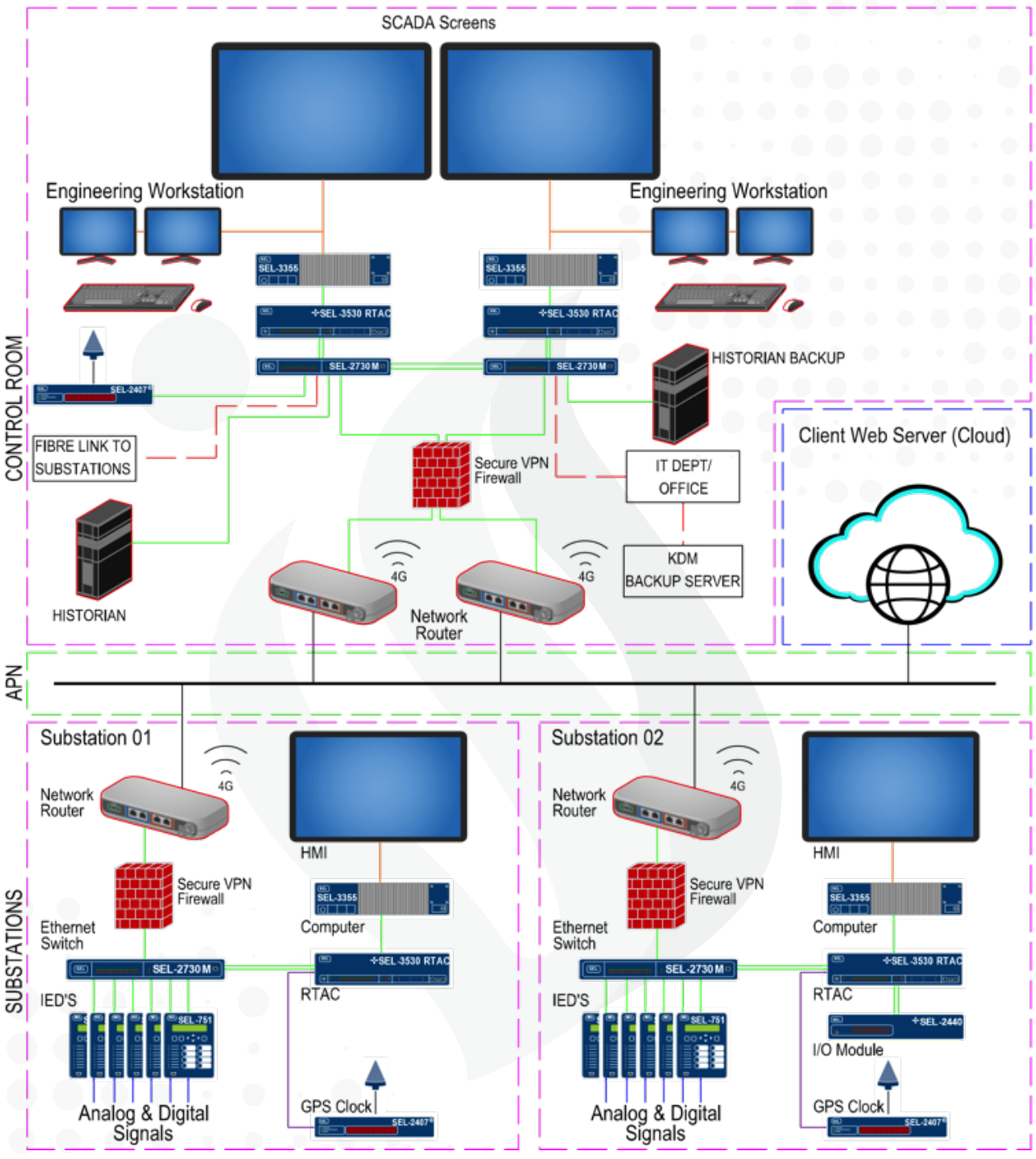

How SCADA brings big benefits

The SCADA system and Control Room will enhance the capacity of the KwaDukuza Local Municipality to provide efficient electrical services by:

- Providing real time monitoring and control of the electrical network.
- Improving response times to customer queries or technical faults.
- Enabling optimisation of the electrical services network.

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- Enabling trend analysis of the networks.
- Improving metering and revenue management.
- Improving energy efficiency, monitoring and demand measurement.
- Improving fault finding, power restoration and preventative maintenance.

All the distribution substations within the supply area will be linked to a control centre located at the KwaDukuza Municipal offices. The SCADA system was designed to ensure safe and reliable operation. It will also be simple to maintain.

The following activities were conducted to address the scope of work:

1. Inception Report – This report addressed the scope of the services, safety and environmental management, contract management, commercial management, technical management, resource management, control management, client management and the consultants.
2. Substation Assessments – Substation assessments were done to verify the information that was provided, update information that may have changed and to retrieve information that was essential in developing the specification for the project.
3. Concept Design Report – This report focused on the local and central SCADA architecture design, the communication philosophy that would be adopted, the staffing requirements to implement a project of this nature and a high-level cost estimate.
4. Functional Design Specification Report – This report focused on the detailed requirements for the SCADA system which included the hardware, application software, visualisation and operation, communication, access security, the installation and commissioning of equipment.

Why KwaDukuza Local Municipality needs SCADA

The KwaDukuza Local Municipality is a licensed electrical services provider and supplies an area covering an estimated 505 km^2.

This includes the towns of Ballito, Compensation, Shakaskraal, KwaDukuza, Darnall and the coastal villages of Blythedale Beach, Tinley Manor Beach, Zinkwazi and Nonoti.

Eskom is the electricity provider in the remainder of the municipal area.

The 2020 assessment identified that there were 13 095 customers on the billing list. Of these, 1 892 were found to be consuming over 1 000 kWh over a period of six months and as per regulation 773, these should be Automatic Meter Reading (AMR), and there were 593 customers with maximum demand meters and modems installed for remote billing.

Based on the billing data for the year 2022, the utility currently has 489 high use customers in KwaDukuza.

The municipality has three electrical intake points from Eskom, referred to as Point of Supply (POS), within its supply area. The supply network includes a 33kV and a 11kV distribution system.

In the last decade, this area has experienced tremendous economic and residential growth with the influx of people from adjacent rural areas. This has intensified the need for the expansion of the electrical network and services.

It is expected that the area will continue its growth path due to its favourable location near the Dube Tradeport, King Shaka International Airport and its proximity to the port and

industrial estates at Richards Bay.

The expansion of the service area, the challenges of managing demand and supply amid load shedding, and the growing customer base have made it necessary to establish and operate a SCADA system for the electrical services network.

The SCADA system will be owned and operated by KwaDukuza Local Municipality.

How SCADA works

The SCADA system includes intelligent monitors placed throughout the key distribution components of the supply system. All these monitors are connected to a central Control Room by radio communication technology and programmed to provide information about the system at regular intervals.

This allows for the remote monitoring of components of the electrical network from one central point.

The SCADA system provides information about the electricity supply network in real-time through customised user reports.

The monitoring system is linked to a central Control Room that can provide direct access to all the information collected by the SCADA.

This will allow the municipality to identify and locate faults quickly, which will facilitate the assignment of repairs, the handling of queries and the providing of timeous and accurate feedback to customers.

The SCADA system will improve service delivery and strengthen the investment and development potential of this area by assuring a more secure and stable supply of electricity.

The SCADA system's communications platform takes into account the extent of the area, its topography and the available communication infrastructure.

The existing communication protocols for each substation will also be considered. The system will use a radio network to ensure precision and the perfect synchronisation of time between the substation sites and the Control Room.

The interval of data recording will be one second for "events", which include sudden changes in power flow, interruptions or surges.

The system will also record essential data about the network's performance every minute.

This includes general time-stamped data like Current, Voltage, Active Power, Reactive Power and Apparent Power applicable to the system. The SCADA system will calculate the average value of these measurements over a one-minute period, and record them onto the SCADA database at the Control Room.

The master SCADA system and its outputs were designed to be compatible with the existing Geographic Information System (GIS) used by the KwaDukuza Local Municipality, which is based on the ESRI® platform.

The computer and communication technology conforms to the KwaDukuza Local Municipality Information and Communications Technology (ICT) standards and policies. The system allows for regular backups of the system, settings and monitoring data on a daily, weekly and monthly basis.

The SCADA system has been designed to be modular in order to allow future expansion or the addition of infrastructure components to the electricity supply system. It is also capable of including future linkages or integration with an Outage Management System or Incident Recording Management Information System and a Streetlight Management System.

The municipality's management and operations teams have secure, remote access to all the

information via the internet through a web-based Human-Machine Interface. This allows managers to view the status of the supply system and control the electrical services network from any location – they do not need to be physically in the Control Room.

The system is capable of generating reports to the exact requirements, formats and frequency required by KwaDukuza Local Municipality.

These reports include:

- Electricity consumption
- Faults reported and faults resolved
- Alarms reported and alarms resolved
- Trends analysis

The reporting and recording of the data will assist the municipality to determine the reliability of the network according to international standards such as for the SAIDI (system average interruption duration index) and SAIFI (system average interruption frequency index) values.

Other SCADA functions include monitoring the overall state of the network and a display of events and trends.

Encouraging local economic activity

To encourage local economic activity, the technical maintenance of the system hardware and software will be supported through local service providers who are based in South Africa or within 250km from the municipality.

The system's designers and the KwaDukuza Local Municipality will establish the operating rules to determine what happens when the system triggers a signal indicating a fault. These standard operating procedures will specify what chain of actions will be undertaken, by whom, and when the action will be initiated.

The location of the Control Room will be in the same building housing the municipality's Electrical Services Department, the Lavoipierre Building, Industria Crescent, KwaDukuza.

The Control Room will allow for access and operations to take place 24 hours a day, seven days per week, 365 days a year.

The staff complement in the Control Room will include:

- One SCADA team leader or administrator with full rights to the system.
- Two technical operators with full rights to the system.
- One customer care official with view access only.
- Technical operations: maintenance, management of the SCADA component site installations.

The staff will be fully trained in the monitoring and response procedures.

The customer care official will be able to access information directly from the SCADA system to assist with responding to queries and conducting follow-up investigations into faults.

The Control Room can be safely operated during power failures as it includes an Uninterrupted Power Supply as a backup for 365 days of the year. The backup hardware and procedures have been matched to the existing ICT protocols and policies of KwaDukuza Local Municipality.

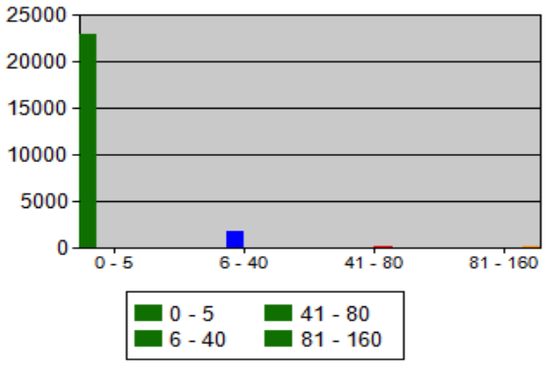
The Control Room and its operations are protected by security measures and access control regulations.

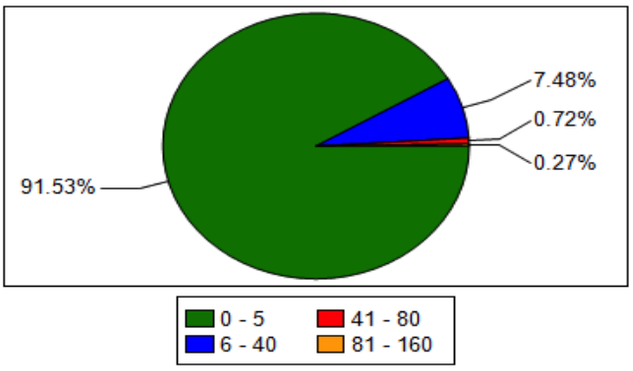
The type of information that is logged, stored and communicated to the master SCADA database, as well as the intervals of data logging and recording, have been designed to extract the maximum benefit from the system.

This allows the KwaDukuza Local Municipality to keep its eyes on this prize as it manages the demand and supply of electricity to consumers.

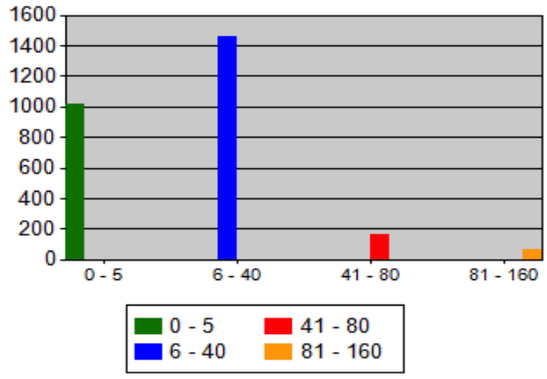
Call centre statistics

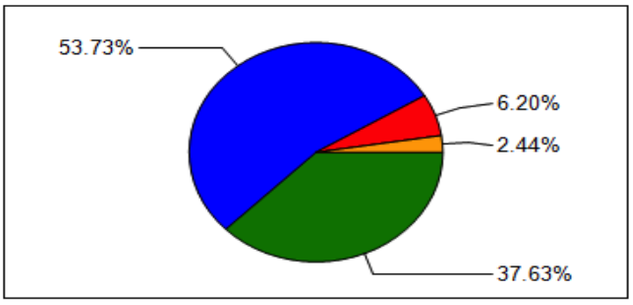
Total Calls





Unanswered Calls





Conclusion and lessons learnt

There were significant constraints on the capacity of the participating municipalities to engage on the project.

While many municipal managers are committed and competent, they tend to become overloaded. Their focus tends to be on meeting compliance requirements, instead of service delivery.

More time was required to allow for an appropriate process of consultation and generating the understanding and buy-in of the beneficiary municipalities.

The identification of a senior official as a project sponsor in each of the beneficiary municipalities to drive the initiative and highlight its priority could improve the speed of delivery on the project.

There is a distinct divide in the levels and standards of infrastructure-based services provided in the urban and rural areas.

Customers in the formal urban areas are able to contribute the finances required to support the provision of the basic services in their areas. However, there are minimal surplus funds to address the significant backlogs that exist in the rural areas.

The iLembe district and local municipalities (with the exception of KwaDukuza Local Municipality that has extensive formal areas) depend significantly on grants from national government.

The Division of Revenue Act (DORA) allocations provided by central government to address service delivery for the poor do not sufficiently address the overall financial needs of the municipalities.

In this environment of significant constraints on resources, it is even more imperative for municipalities to focus on being innovative to improve revenue generation from an increasingly stressed economy.

It is also essential to take steps to ensure that the limited resources available are applied in an effective and efficient manner.

This means that municipalities must have a grip on their status in a structured and holistic manner, and they must understand future needs and priorities.

Municipalities need to be equipped with the tools and techniques to ensure that existing and future infrastructure is managed in the most optimal manner.

The SCADA system, and the strategies proposed to curb non-revenue electricity, will allow the municipalities in this project to fulfil this objective.