

# Energy Losses Management Programme Eskom Distribution

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## Abstract

The intent of this paper is to highlight the strategy and to present an overview of Eskom Distribution's Energy Losses Management Programme. An energy loss is of concern across South Africa and is an issue that many utilities around the globe face. This paper will explain how Eskom is addressing the energy losses issues experienced, what the programme has learnt over the years and what will be the areas of focus going forward. It will also briefly outline the meter auditing process and findings, one of the key focus areas of the ELP Programme.

## 1. Eskom Distribution energy losses problem

Utilities globally are battling with the problem of Energy Losses. This problem cost utilities billion of rands annually and developing countries are worst hit. Eskom is not immune from this global challenge.

Before getting into details about this problem, one must ensure that we all have the same understanding of what we are talking about. For the purpose of this paper, Energy losses for Eskom Distribution are defined as the difference between energy purchased measured at the Transmission networks and energy sold to all Distribution customers (measured or estimated). This includes both technical energy losses (energy lost in the electrical networks due to the flow of current or energisation of the system) and non-technical energy losses (caused by various factors, amongst others; energy theft, incorrect or faulty metering, billing, etc). This excludes non-payment or debt management.

Energy losses **increased from 4% to roughly 6% in a period of four years** (between 2002 and 2005). Even though this level of percentage losses was within the 1<sup>st</sup> Quartile of the best performing Utilities globally, Eskom became increasingly worried about the steady increase (see figure3). This prompted Distribution management to establish the Energy Losses Management Programme (ELP).

Sometimes when one talks about energy losses in terms of percentages, the significance gets lost in there. The significance of the energy losses figure presented above becomes evident when the same is represented in terms of cost or demand on the system. If one takes the 2006 Financial Year as an example, the energy losses as a cost to the Distribution Business was approximately **2,4 billion Rand**, of which almost half could be attributable to non-technical losses.

Energy Loss prevented or recovered talks directly to the Utility's profitability, because it either reduces the cost and ease demand on the system to be used by other customers or recover additional revenue the utility would have otherwise not recovered. That is why it makes even more sense for Eskom to manage energy losses tightly now that the system demand and profitability is under strain.

## 2. What is Eskom doing to address energy losses?

Energy losses management has always been on the radar for the Eskom Distribution Business. However, in the past few years it became one of the Key Focus areas as part of the Business Efficiency Improvement measures.

The increasing trend was affecting the Business Efficiency negatively. In response to the increasing Energy losses trend, Eskom initiated the Energy Losses management Programme in 2006, to investigate the root causes and address the problem.

Success of the Energy Losses Management Programme was to be measured by the impact on the energy losses trend. Not only is this impact measured at Regional level, but at National level as well. Successes so far reflect the desired impact of ELP during 2006. The ELP strategy is producing results and aims to:

- arrest the increasing energy losses trend,
- reduce energy losses to an acceptable level, and
- ensure sustainability of effective losses management in the future.

Arresting the increasing trend has been achieved, as evident in the accompanying trend line (Figure 1). The remaining challenge is to sustain the gains made as we move into the future. Sustainability is critical to the success of the programme as it determines the successful hand-over from project based initiatives to normal business operations.

### 3. ELP Strategy Formulation and Implementation

The Energy Losses Management Programme is founded on a strategy supported by key stakeholders in Eskom Distribution. From September 2006 to March 2007, the strategy was developed through careful analysis of the nature, extent and causes of energy losses over a significant period of time, using data and resources across Distribution's business.

Ratified and approved by the highest decision making committee in Distribution, the strategy was deployed in the business. The Programme has actively implemented this strategy since then.

ELP is divided into five work streams, each looking at specific aspects that assist in the management of energy losses. The programme streams are depicted in figure 2 below.

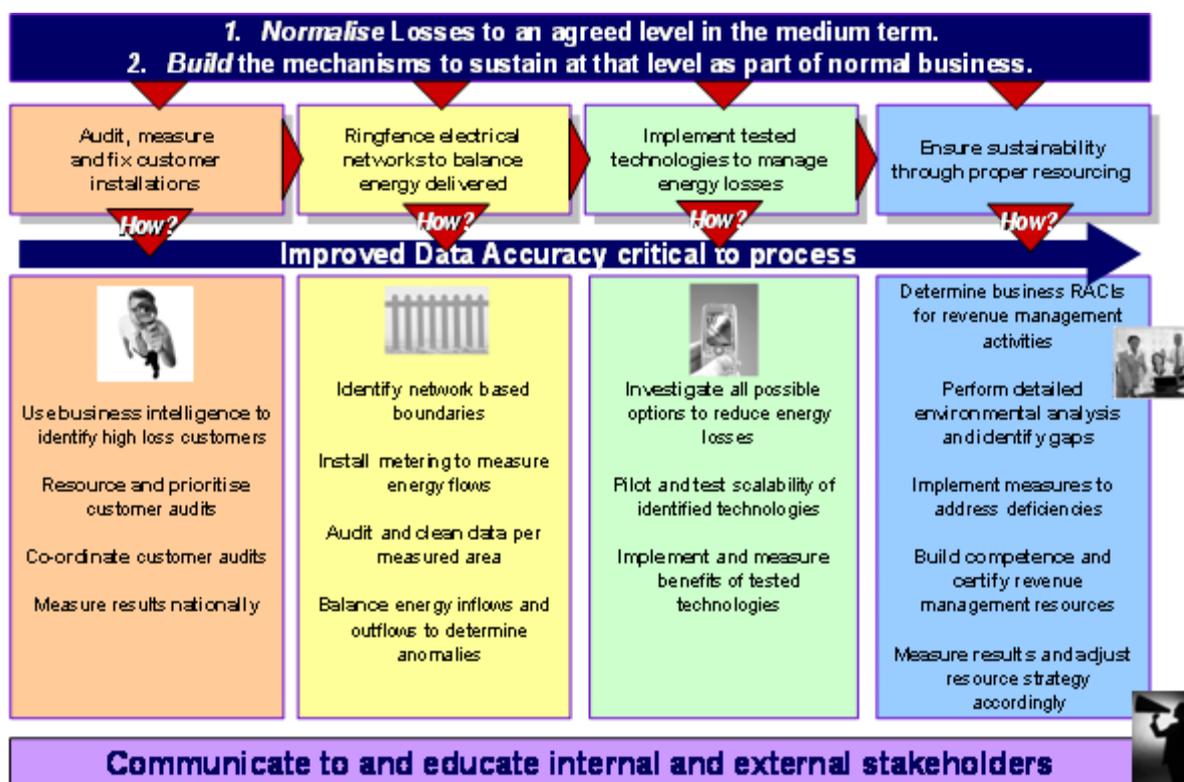


Figure 2 The ELP Streams

### 3.1 Audit stream

The audit, measure and fix work-stream uses business intelligence to identify and target customers that are high loss, and hence high risk, customers. Customer audits are prioritised using anomaly reports such as customers that are consuming very low in comparison to other customers in the same category, or customers consuming even though their accounts have been terminated. Results of audits are measured on the ELP scorecard where the number of audits done per month and number of problems fixed per month are tracked and measured.

In the past two years the programme focussed on this stream and therefore one would like to elaborate a little more on this section.

The Energy Losses Management Programme has developed and standardised the Large Power Users (LPU), Small Power Users (SPU) and Prepaid Users (PPU) audit method and process in Eskom Distribution. This process is applied in all 6 regions of Distribution. The standardisation includes the audit methods for LPU, SPU and PPU meters, collection of data on the field (data specifications) and the reporting of data to the National PMO. Audit data is reported in specific formats which have to meet specific quantity and quality requirements. The audit methods encompasses processes unique to each customer class (LPU, SPU or PPU), yet holistically address the energy losses management requirements of Eskom.

The generic **audit methodology** has four elements, aimed at addressing different stages of the auditing process. Although these are unique to each customer type, they essentially involve a **desk top audit** (data audit), where the customer information held on file is compared and checked against information held on the system. Any discrepancies between the two are addressed and followed up with the relevant departments.

The second leg of the audit methodology involves an actual **field audit**. This field audit consists of a technical inspection, where the meter and point of installation are technically verified for any abnormalities. This is the critical stage, as it is through this part of the audit process that crippling energy loss issues such as tampers and illegal connections are identified. Any meter related problems are also flagged. The technical inspection has two legs. It involves physical interrogation of the meter and collection of current consumption data. This current data is then compared to and checked against the information held on the customer billing system, to ensure that system data is updated and accurate. Any faults identified on site have to be corrected.

This leads to the third element of the audit methodology, which is **fixing the identified problems**. The corrections are done in conjunction with or through the relevant departments/functions in the business e.g. Metering, Field Services, Customer Services, Forensic Investigations, etc. These identified faults are followed up with the relevant department until all issues are corrected and closed out.

The fourth and final element of the audit methodology is **monitoring**, after all the faults identified have been corrected and closed out. The data collected during the field inspection and fault correction must be reported in a specific format that enables data verification, measurement and analyses. The programme has prescribed data specifications that must be followed for each type of audit. **Revenue recovery** component the audit process is also part of this leg, where we can quantitatively measure the benefits of auditing versus the costs of auditing.

### 3.2 Ring-fence stream

The ring-fence work-stream ensures that meters are installed on feeders for the purpose of energy balancing. The energy measured at these meters is compared to energy measured down-stream at customer premises (for all customers fed from that feeder).

This process assists in identifying high loss feeders which can then be targeted when planning audits. Currently not all feeders are measured and as such through the programme we have identified feeders which need meter installations.

The plan is to install meters on all feeders going forward. As a result we have requested that all new substation designs going forward should include metering at feeder level as a standard.

### **3.3 Technology stream**

The implemented tested technologies work-stream focuses on investigating technology options to reduce energy losses, piloting and testing these technologies and measuring the benefits. Technologies proving to be beneficial to the business will then be implemented through out the business after piloting.

### **3.4 Sustainability stream**

The sustainability work-stream focuses on detailed business and environmental analyses to identify gaps in the business. These gaps could be process, people and technology related. As soon as the gaps are identified, mitigation plans are developed and implemented to close them during the project ensuring that these are sustainable even after the project.

### **3.5 Communications stream**

In the communications work-stream, our focus is to communicate (inform and educate) the internal staff about ELP and the management of energy losses generally, as well as informing the external stakeholders about our activities and challenges related to energy losses management.

Internal staff is educated on what energy losses are and the impact their work activities have on energy losses. The idea here is that when employees are aware how their processes and daily activities impact losses, they can assist in the management thereof.

For the external communication, the target market is customers and general public. A social marketing approach has been adopted which demonstrates to the public the benefits of "doing the right thing" (not tampering or illegally connecting themselves or each other), as well as addressing the issue of public safety and illegal connections.

### **3.6 Improvement of Data Accuracy**

Another issue which was critical in the implementation of the strategy was data accuracy. The strategy relied more on system and customer data. With inaccurate data, one could deploy resources in areas where you do not necessarily need to, which will render your strategy or activities ineffective.

This was identified during strategy formulation, and a decision was taken that the programme will not necessarily initiate a data clean-up stream, but will utilise existing channels to ensure that data issues are resolved timeously. However, a decision was taken that each stream should ensure that data collected from the field is effectively updated in the system, so that the system data can be as current as possible.

#### 4. The structure of the ELP

The structure of the ELP consists of a National Programme Management Office (PMO) with all work-streams reporting to Project and Programme Managers. The National Sponsor is ultimately accountable for all deliverables of the National PMO. The ELP Steering Committee consists of executive members of Eskom Distribution. It is this committee that approves, supports and drives the ELP strategy and implementation approach.

All 6 Eskom Regions also have Regional ELP implementation structures in operation. There are Task Teams in place where Regional Project Managers are responsible for all ELP related activities. The Project Manager reports to the Regional Champions (Revenue Protection Managers and Energy Trading Managers), who then report to the Regional Sponsor who is ultimately accountable for all Regional deliverables.

#### 5. The Energy Losses Management Scorecard

A scorecard was developed in support of the strategy. The scorecard is used to measure effectiveness of the activities and track outputs for the different regions. This scorecard is then used for Regional Performance Management, which impacts individual's performance bonus.

The idea with the scorecard was to start with a higher weighting (80%) on the Input Key Performance Indicators (KPIs) and reduce this over time while increasing the weighting on the Output KPIs. This was to ensure that the programme was activity driven because we believe that the activities will eventually drive the results. It was believed that as soon as activities are effectively carried out, the output will follow. As soon as the activities are deeply entrenched as normal business practice, focus could shift to the output.

Key Strategy Component	Key Measures	2007/08 Weighting	2008/09 Weighting	2009/10 Weighting
Targeted Field Audits	LPU Low / No Consumption, Terminated PODs Advancing, Service Points Without Meters	50%	10%	5%
	SPU Low / No Consumption, Terminated PODs Advancing, Service Points Without Meters			
General Audits (Methodology Based)	Number of LPU's Audited	20%	40%	35%
	LPU Fix Rate			
	Number of SPU's Audited			
	SPU Fix Rate			
	PPU Fix Rate			
Feeder Balancing	% of Customers on Balanced Feeders	10%	20%	20%
	% Unallocated Customers			
Energy Losses Measurement	Total Losses	20%	30%	40%
	EBM1 Residential Losses			
	EBM2 % Coverage and Residential Losses			

Figure 3 ELP Scorecard

## 6. Achieving Results

The results from the time ELP was launched to-date are promising. The Energy Losses trend below shows a positive impact of the programme. The first objective of arresting the trend was achieved and exceeded in the first year. At the end of the second year the programme managed to reduce losses from 6% to 5.5%.

### Trend of total Distribution energy losses

Jan 02 – Apr 09

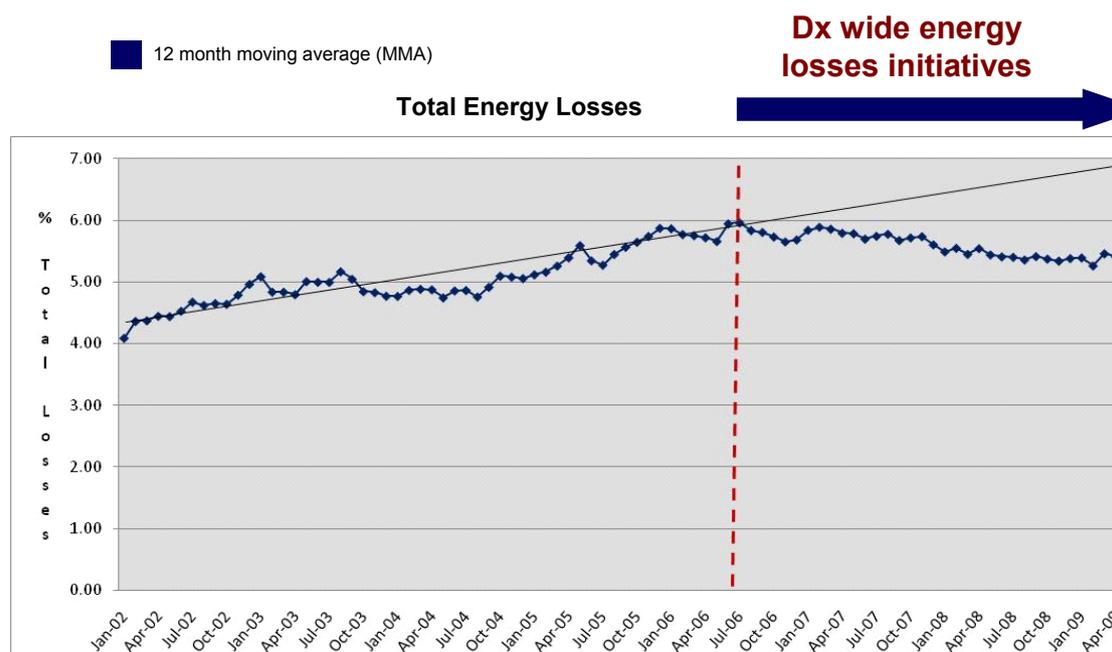


Figure 3 Trend of total Distribution energy losses

Other notable results achieved through the programme came from the audit stream where the number of meter installation audits increased significantly as compared to previous years. In cases where problems were found and fixed, the business realised increased sales and revenue.

Summary of customer audits done (since the start of the project, up to end April 2009):

- 13,528 LPU audits were done, with 1,561 problems identified and 1,325 problems fixed.
- 121,521 SPU audits were done, with 25,951 problems identified and 12,012 problems fixed.
- 1,341,640 PPU audits were done, with 172,930 problems identified and 116,069 problems fixed.

Over and above the development of the standardised audit methodology and process, the programme also implemented Quality Assurance (QA) for customer meter audits. The Regions are visited every three months to ensure data validity and authenticity, and ensure compliance with the audit methodology. This has drastically improved our confidence in the reported results.

## **7. Lessons learnt**

The results achieved by the programme are attributable to a number of factors, but key to those are the following:

- Senior leadership support
- Planning and follow through
- Standard Methodology and processes
- Dedicated resources who are willing to learn and test boundaries at times
- Communication (internal and external)
- Teamwork

## **8. Concluding Remarks**

Energy Losses Management is a multidisciplinary process, which requires resources and processes from different departments to function in unison. If one of them fails the whole chain breaks. So there is a need to have senior over side role to ensure the various role players function as a team even though managed in different places.

The current global financial and economic crisis will make the effort of managing energy and revenue loss much more difficult and the gains achieved thus far might be reversed if we do not increase our efforts in this environment. The risk has increased and we seriously need to work hard to defend the gains.

Anything is possible if we put our minds to it. The results from the ELP are living proof of that, so let's go do it.