

Southern Africa Revenue Protection Association



# SARPA Convention 2018 Presentation: **IMPORTANCE OF USING LOAD PROFILING &** DATA MINING TO LOCALISE & DETECT **DEVIATION OF THE CUSTOMERS** 23 AUGUST 2018 Presentation by Ms. Salome Tshikomba



Southern Africa Revenue Protection Table of Contents



- 1. Background
- 2. Power Loss
- 3. Load Profiling and Data Mining Technique
- 4. Load Profiling Based NTL

Association

- 5. Data Mining Based NTL
- 6. Consumption Trend And Trend Drop
- 7. Conclusions



### Background



- The paper will present the method of load profiling and data mining to detect and minimize stealing of electricity.
- Municipalities are loosing electricity revenue due to electricity theft, inaccurate billing data, unbilled customers and non-cost reflective tariffs. Technical and non-technical losses require continuous and efficient control supervision by Utilities to minimise them(NTL).
- The advantage of load profiling is that the Utility tends to know the customers and can provides better marketing strategies and improves efficiency



#### **Power Losses**



#### Power Losses

#### **Technical losses**

consist of generation losses due to turbine efficiency, losses due to the current flowing in the electrical network such as line losses, copper and iron losses of transformer.

#### Non Technical losses

- Non-payment of electricity bills
- Unauthorized line tapping and diversion
- Losses due to faulty meters and equipment

- Inadequate or faulty metering
- Poor revenue collection techniques
- Inadequate and inaccurate of meter reading
- Inaccurate customer electricity billing
- Loss/damage of equipment/hardware e.g. protective equipment, meters, cables/conductors and switchgear
- Inaccurate estimation of nonmetered supplies, e.g. public lighting, agricultural consumption, rail traction



### Load Profiling and Data Mining Technique



- Load profiling is defined as an electricity load consumption pattern for a customer or a group of customers over a given period.
  - The monthly correlated data provides valuable information regarding the consumption characteristics of LPU customers, which helps to expose abnormal consumption behavior that is known to be highly correlated with NTL activities

# Advantages of the load profiling technique

- Provides satisfaction and cost effective approach compared to existing techniques
- Assist Utility Companies in determining the demand price.
- Provides better marketing strategies and improves efficiency.



## Load Profiling and Data Mining Technique Cont.



Load Profiling Analysis

- Load profile determination clustering technique
- Customer characterization Load pattern, load profile
- NTL analysis module detection and predictive method

Data Mining

- Customer characterization- Load pattern, load profile
- Data Selection
- Data Preprocessing
- Data mining Techniques/Descriptive Datamining
- Data Mining Techniques/Predictive Data mining

Predictive data mining

The major goal of the predictive module is the inference of a rule set to characterize the normal and anomalous customers.

Descriptive Data mining It is base on the following:

- Variability of customer consumption
- Consumption trend analysis
- NTL or other features



#### Loading Conditions



- Loading condition separates data into smaller data sets as shown on table 1;
- The need for loading conditions is crucial because different loading conditions yield different load shapes from one customer to another..

Loading conditions	Items
Type of customer	Domestic
	Commercial
	Industrial
Location	Urban
	Rural
Voltage level	Low Voltage
	Medium/High Voltage
Type of climate	Rainy/ windy
	Hot/Cold
Type of day	Week day
	Saturday (weekend)
	Sunday (weekend)
	Public holiday



## Data selection



- When choosing customers it is very important to look at the following feature characteristics:
- Period of recorded invoices e.g. monthly or bimonthly.
- Geographical localization e.g. all customers are in Region 1 or Region 2.
- Contractual power: LPU or SPU (HT, 1ph, 3ph).
- Economic activity classification e.g. high rate of NTLs, the investigations will be
  - Centered in these sectors.
- Consumption range, 20Amps to 60Amps etc.
- History of customer inspection



### Association LOAD PROFILING BASED NTL (CLPNTL) ANALYSIS FRAMEWORK









### **Consumption Trend**



- Consumption Trend drops but returns to original levels
- Customer gone on Vacation or away for public holiday





### **Consumption Trend drop**







## Conclusions



The load profiling technique is a unique method of checking the electrical load consumption pattern of the customer or customers over a given period. It is easy to use when detecting the outliers but it needs competent staff to acquire data, analyse it, interpret to detect outliers and send for audit on site, impose temper fee if any tempering or normalize the meter if malfunctioning. Load profiling produce good results where a large database with too many customers that are connecting illegally are experienced, the results can be good and systematically checked.



# THANK YOU

# QUESTIONS?