

**HOW WIRELESS ELECTRICITY THEFT  
DETECTION CAN ASSIST IN  
REDUCING THE THEFT OR “STEALING” OF ELECTRICITY**



**9 October 2018**

**Presentation by**

**Ms. Salome Tshikomba (Colleen)**

# Introduction

- The presentation looks at the current technologies that will 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.
- The paper spotted transmission and distribution of electrical energy as the most affected areas in terms of losses.

## Power system Losses

POWER SYSTEM  
CONSIST OF:

TECHNICAL LOSSES

- $C_{\text{Com Loss}} = U_{\text{Elec Cost}} \times E_{\text{Loss}} + M_{\text{Maintenance Cost}}$

ENERGY LOSSES

- $E_{\text{Loss}} = E_{\text{Delivered}} - E_{\text{sold}}$

NON – TECHNICAL  
LOSSES

- $C_{\text{NTL}} = C_{\text{Com Loss}} - C_{\text{Technical Losses}}$

## 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 non-metered supplies, e.g. public lighting, agricultural consumption, rail traction
- Inefficiency of business and technology management systems

# Techniques

**Types of techniques available to deliver the information to the authorised Utilities to control the theft of the electricity.**

## **Wired techniques**

- Electrical cables
- Coaxial cable
- Optical fiber

## **Wireless technique**

- ZIGBEE technology
- GSM technique
- WI-FI
- Infrared
- Wi-max
- Bluetooth

# Wireless Sensor Network

## What is wireless sensor network?

- WSN is a group of sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location.

## Why wireless?

- To avoid lot of wiring
- Saves installation costs
- It can accommodate new device any time
- It is self organized network
- It is low power and low cost

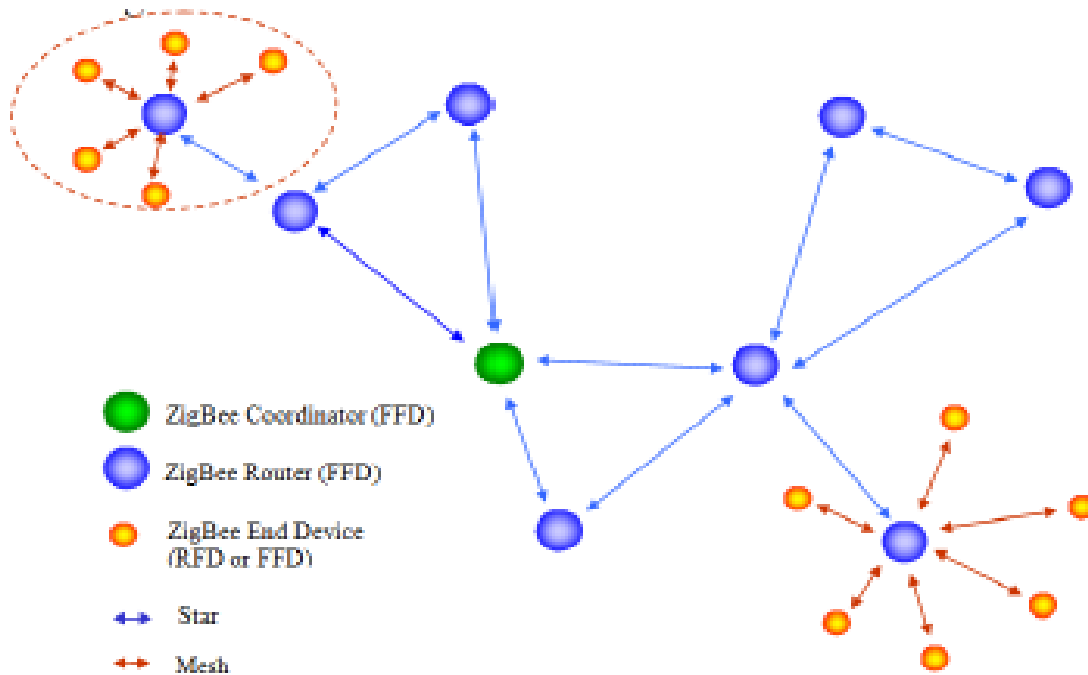
# Zigbee Technique

What is Zigbee?

Zigbee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless internet of things networks, it operates on the IEEE 802.15.4 physical radio specification and operates in unlicensed bands including 2.4 GHz, 900 MHz and 868MHz.

# Zigbee Technique

What is Zigbee?





## ZIBEE Function

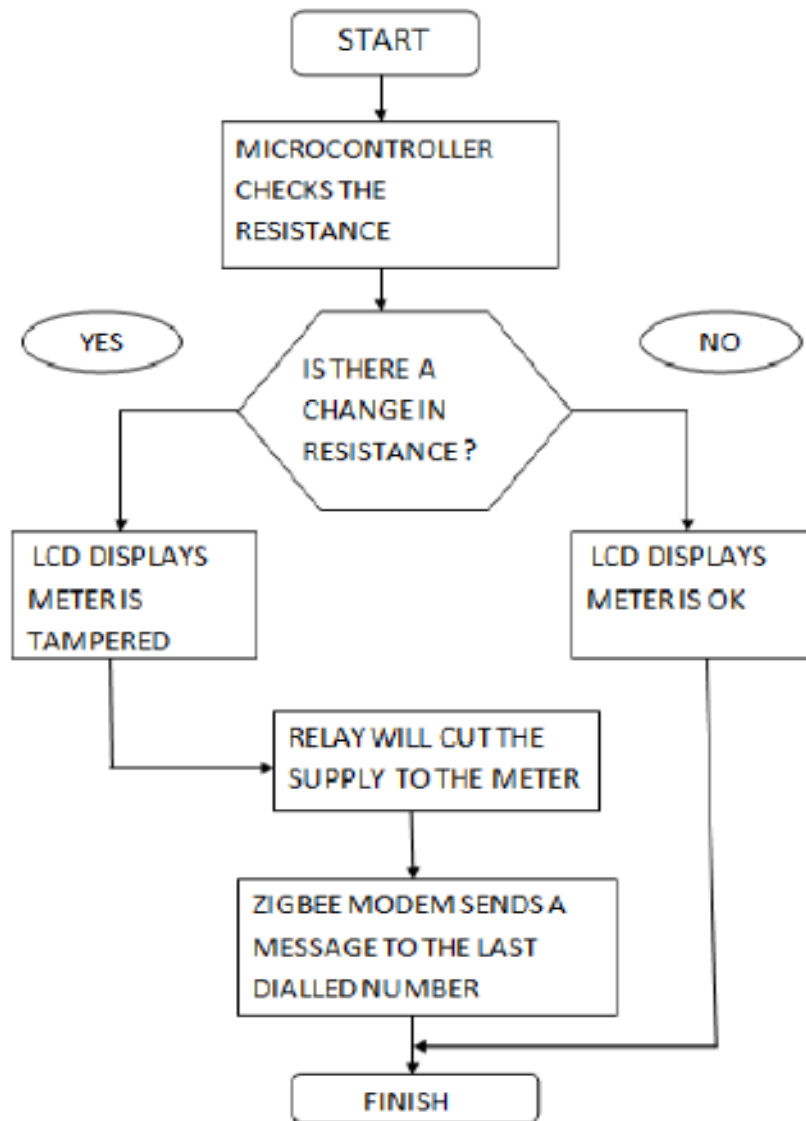
- The flow chart shows how the system works to prevent the electricity theft that is firstly the microcontroller checks for the resistance and if there is change in the value of the resistance, the supply will cut off and the LCD will show that the meter is tempered. To operate the microcontroller via the relay there is a need for amplifier circuit because no direct access of the relay to the microcontroller. When the microcontroller switches off the load, the ZIGBEE

# Zigbee Cont.

## ZIGBEE Function cont.

Modem sends the results to the Utility's authorised official. The system will not allow the consumer to reset, meaning it will only allow the person from authorised Utility to reset. The microcontroller will convey the information to the relay and switch from ON to OFF and the power supply to the meter will switch off by the system. Then the LDC will display the message "Meter tempered" and this message will reach the Utility's official. The process flow is shown below.

# Zigbee Process Flow



# Summary

<b>DESCRIPTION</b>	<b>ZIGBEE</b>	<b>WIFI</b>
Network type	WPAN (Wireless Personal Area Network)	WLAN (Wireless Local Area Network)
Network size	Up to 65536	32
Network Architecture	Star, Tree, Mesh	Star
Range (meters)	1 to 100+	1 to 100
Frequency Band	2.4 GHz and 868/915MHz	2.4 GHz and 5 GHz
Battery Life	Years	Hours
Application focus	Monitoring and Control	Web, Email, Video
Data rates (K bits/s)	250	11,000+

# Conclusion

- The proposed technique is already on the market, but Researchers are still trying to find the loop holes around it, like network communication failure over a long distance and cyber attacks etc. Compared to other existing technologies is still the best, especially for its wireless properties and it does not require license like any other wireless techniques. Low cost, long battery life and limited staff.

# THANK YOU

# QUESTIONS?

