How AMI helps utilities reduce losses and enhance revenues
CONTENTS

01 | What are the losses
02 | Payment Collection
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What are the losses
Technical losses are possible to compute and control.
Non-technical losses are very difficult to measure.
Non-technical effects

- Non-technical losses negatively impact well-behaving-electricity consumers.
- Financial sustainability of the power sector, elimination of those losses should be a matter of high national priority for every country.
- Sustainable optimal reduction of non-technical losses and elimination of non-technical losses should be the responsibility of a national power company.
Challenges faced by Utilities

**Revenue Collection**
No Payment/Collection
Collection Delay Huge Arrear…

**Power Loss**
Technical
Commercial/Tamper…

**Key Asset Management**
Transformer Protection/Monitoring
Cable/wire Theft…

**Customer Service**
Power Vending/Billing
Outage Management…
PAYMENT COLLECTION

NYAMEZELA METERING REVENUE ENHANCEMENT SOLUTION
Large Power Customer:
Converting large power users to: PREPAID!

Residential/Commercial Customer:
PREPAID!

Utility Management:
lack of manpower, low collecting efficiency or collection
MUCH EASIER & MORE EFFICIENT!

NYAMEZELA & INHEMETER Prepayment Solution:
Guaranteed Revenue Collection
Buy electricity First, Consume As Payment
Flexible methods to buy electricity: POS, SMS, Internet, ATM/AVM…
Arrears can be managed through guaranteed revenue collection process.
LPU Solution: Large User Collection Guaranteed:
Our Large Power User Solution is designed for large power consuming users: medium voltage (11KV-35KV) and low voltage big current (150A-2000A) customers. OUR LPU can be PREPAID or POST-PAID and AMR.

No Payment/Collection Delay Huge Arrears

Large Power User (LPU): Utility Management:
lack of manpower, low collecting efficiency or collection fraud... NOT A PROBLEM NOW!

BOX 35KV  BOX 2000A (CT)  BOX 300A (DT)
**Power Loss: Commercial Loss (Tamper)**

**User Common Tamper Activities**
- By-Pass
- Live and Neutral Exchange I/C & O/G
- Interchanged Neutral Earthing or Missing...

**TAMPER PREVENTED BY METER!**

**Utility Management:**
- difficult to detect & disposal (disconnection/reconnection cost), staff fraud with users...

**TAMPER PREVENTED BY METER!**

**Meter Anti-Tamper Functions**
- Cover Open Detection & Control: Record + Disconnect Double Measurement Elements
- Double Relay
- AMR: Automatic Report & Control & Real Time Record
- Compatible International Standard & Protocol: STS + DLMS
- Programmable Load Adjustment/Control (Disconnection) Severe Voltage Condition Control/Disconnection Prepayment and Post-payment/AMR Programmable …
BYPASS

Bypassing TAMPER
NO Measurement
Current can be measured

Bypassing TAMPER

Double Elements Measurement
The way forward: strategies and plans to achieve sustainable reduction of non-technical losses

- Technological revolution: prepayment, remote meter reading and AMI

Large-scale application of AMI can significantly contribute to sustainable development and efficient performance of power sector in any countries. Economic benefits as follows:

- Reduced metering reading and data entry cost
- Remote detection of any abnormal consumption due to tampering or by-passing meter
- Reduction in errors and corruption-unpaid bills
- Implementation of pre-paid consumption (very good commercial option)
- Elimination of losses in non-manageable areas.
- Demand side management to maximize efficiency in electricity supply and consumption.
- Power quality measurement and continue to improve
- With the use of web-portals, mobile apps, or in-home displays, customers can monitor and potentially lower their energy consumption.
Large consumers connection and management

- Achieving “zero non-technical losses and 100 percent collection” in electricity supply to large consumers connected to high- and medium-voltage networks should be pay attention.

- In general, sales of electricity distribution companies are characterized by the Pareto or the “ABC” Law. A small number of large consumers (seldom more than 1 percent of total) represent more than 30 percent of the revenue of a distribution company. This group consists of all consumers supplied at high- and medium-voltage levels and the largest ones connected to low-voltage networks. It is crucial for the financial health of the company to ensure full billing of, and full payment by, 100 percent of its large consumers.
Regularization of supply to areas with high non-technical losses

- Low-voltage lines and customers connections that need to be renovated
- Prepayment smart meters to be installed
- Replacement and installation of new switchgear equipment (reclosers, disconnectors, etc.) needed to optimize network configurations and operation.
- Other infrastructure issues.

These measures can significantly increase the revenues of utilities with high non-technical losses.
# AMI communication technologies

<table>
<thead>
<tr>
<th>Technology / protocol</th>
<th>Home area network</th>
<th>Last mile</th>
<th>Wide area network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wireless</td>
<td>• RF mesh</td>
<td>• RF mesh</td>
<td>• Cellular</td>
</tr>
<tr>
<td></td>
<td>• ZigBee</td>
<td>• ZigBee</td>
<td>• Satellite</td>
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<td></td>
<td>• Wi-Fi</td>
<td>• Wi-Fi</td>
<td>• LPWA</td>
</tr>
<tr>
<td></td>
<td>• Bluetooth</td>
<td>• Millimeter Wave Technology</td>
<td>• Long Wave Radio</td>
</tr>
<tr>
<td></td>
<td>• Z-Wave</td>
<td></td>
<td>• TVWS</td>
</tr>
<tr>
<td></td>
<td>• NFC</td>
<td></td>
<td>• Private Microwave Radio</td>
</tr>
<tr>
<td>Wired</td>
<td>• PLC</td>
<td>• PLC</td>
<td>• Optical Fiber</td>
</tr>
<tr>
<td></td>
<td>• Ethernet</td>
<td>• Ethernet</td>
<td>• Ethernet</td>
</tr>
<tr>
<td></td>
<td>• Serial interfaces (RS-232, RS-422, RS-485)</td>
<td>• Serial interfaces (RS-232, RS-422, RS-485)</td>
<td>• PLC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• DSL</td>
</tr>
</tbody>
</table>

*Source: ISGF*
Loss Challenges & Solution

Power Loss: Remote Monitor & Control

- Tamper Record
- Tamper Report
- Tamper Control
- Tamper Analysis
- Load Analysis
- Load Control
- Voltage Analysis
- Voltage
- Protection
- Loss Calculation
- Loss Analysis
- Outage Analysis
- Outage Control
- Communication Analysis
- Power Quality Analysis...

User Common Tamper Activities
By-Pass
Live and Neutral Exchange I/C & O/G
Interchanged Neutral Earthing or Missing...
TAMPER PREVENTED BY SYSTEM!

Utility Management:
difficult to detect & disposal (disconnection/reconnection cost), staff fraud with users...
Key Asset Management

Transformer:
Overloading/Surge (Explosion)/Theft
Cable/wire Theft...

Utility Management:
lack of manpower, improper disposal, low emergency operation efficiency ...
LOSS PREVENTED BY DTMS.

NYAMEZELA & INHEMETER DTMS Solution
- Distribution Transformer Monitoring & Protection Solution is used to detect transformer overloading (current, voltage & load), temperature, theft, etc.
- It protects transformer from surge and overloading led to exposing (asset damage) and it locates site when such event happens and diagnose damage reason.
Loss Reduction & Revenue Enhancement

Smart Metering Solution: Loss Reduction & Revenue Enhancement

Loss Analysis: $M_1 > M_2 > M_3 > M_4$; $M_1 = \sum M_2 = \sum M_3 = \sum M_4$

Nyamezela Metering Smart Metering Solution:
- helps utilities solve the issues of payment collection,
- fight against tamper,
- diagnose and analysis of power loss, power quality, outage, etc.
- monitor key assets to prevent loss of asset.

Overall, it helps utilities have a better business operation result: make business more efficient and profitable.
AFRICA APPLICATION CASES

NYAMEZELA METERING REVENUE ENHANCEMENT SOLUTION
# Countries taking actions

<table>
<thead>
<tr>
<th>Country</th>
<th>Typical losses</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>$&gt;30%$</td>
<td>$990~$ million smart metering project and AMI smart metering project</td>
</tr>
<tr>
<td>India</td>
<td>$&gt;30%$</td>
<td>25 Million smart meter tendering is in progress</td>
</tr>
<tr>
<td>Chile</td>
<td>$\approx5%$</td>
<td>impressive, even better than those of comparable utilities in developed countries</td>
</tr>
<tr>
<td>Botswana</td>
<td>$&lt;15%$</td>
<td>Operated by Eskom, success</td>
</tr>
</tbody>
</table>

*Source: Word bank report*
ESKOM, South Africa

We have installed the first batch of PLC communication Smart Prepaid Meters in South Africa in 2012. We also conducted a series of testing and certification process with SABS and ESKOM Lab.

By 2018, we have supplied ESKOM and municipalities in excess of 500,000 PCS smart prepaid meters and implemented its smart prepaid metering software technology.
In KPLC, Kenya

The water damage and tampering of the DIN meters installed in site had troubled KPLC for a long time. After a series of site investigation and program discussion with KPLC, INHEMETER customized a new generation of DIN meter with protection class of IP54 for KPLC, and it greatly helped in solving the problems because of the new design’s water-proof and anti-tamper features.

From 2015-2017, Inhemeter has supplied over 2.5 million pcs of smart/prepaid meters to KPLC.
<table>
<thead>
<tr>
<th>DC</th>
<th>Meter Qty</th>
<th>Apr. 15</th>
<th>Apr. 16</th>
<th>Apr. 17</th>
<th>Apr. 18</th>
<th>Apr. 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPL 012</td>
<td>626</td>
<td>99.84%</td>
<td>99.33%</td>
<td>99.36%</td>
<td>99.68%</td>
<td>99.84%</td>
</tr>
<tr>
<td>RF 151</td>
<td>541</td>
<td>99.63%</td>
<td>99.84%</td>
<td>97.04%</td>
<td>99.63%</td>
<td>99.63%</td>
</tr>
<tr>
<td>RF 019</td>
<td>157</td>
<td>99.36%</td>
<td>98.47%</td>
<td>99.36%</td>
<td>99.36%</td>
<td>99.36%</td>
</tr>
<tr>
<td>CPL 052</td>
<td>353</td>
<td>99.43%</td>
<td>99.26%</td>
<td>99.72%</td>
<td>99.72%</td>
<td>99.72%</td>
</tr>
</tbody>
</table>

Project results in Côte d’Ivoire:

CIE is satisfied with the results of the implementation of this project for that this project helped reduce their line loss, and improve customer satisfaction.

We have installed vending systems in CIE and have supplied about 700,000 meters so far. And after that, our technological partners have also been providing other software customization services for CIE.
In ESCOM, Malawi:

In an Energy Sector Support Project, ESCOM intends to install AMR/AMI capable meters on the selected MV and LV metering points and LV side of the Distribution transformers and at the selected feeders. INHEMETER is the contractor of these EPC projects and is responsible for supplying, installing and commissioning the AMR/AMI capable meters. The test of communication stability of the metering point and remote reading is successful using ESCOM’s AMR system supplied by a South African company.

Till now, we have successfully supplied over 300,000 prepaid meters and are working closely with ESCOM for technical exchange and project management during the project implementation.
MAKE GRID SMARTER

Thanks for your time