Municipal Electricity Metering

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Content

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4. Advanced Metering Infrastructure systems
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Intention of presentation

- Introductory comments
- Offer a simple overview of metering technologies
- Offer short description, advantages
- Provide a few simple conclusions
According to a 2006 CSIR/cidb Discussion Document: “Towards a framework for the maintenance of municipal infrastructure: In support of government growth objectives”, findings were:

1. Municipalities account for 43% of total volume of electricity sales (Eskom supplies the balance)
2. Few municipalities generate electricity themselves
3. Municipalities are responsible for the entire distribution system, including the metering systems
Guideline to minimum standards
Based on nominal size of load

<table>
<thead>
<tr>
<th>Load</th>
<th>Accuracy Class</th>
<th>Active energy meter</th>
<th>Active energy meter</th>
<th>CT</th>
<th>VT</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 100 MVA</td>
<td>0.2S</td>
<td>1</td>
<td>0.2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>10 – 100 MVA</td>
<td>0.5S</td>
<td>2</td>
<td>0.2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>1 – 10 MVA</td>
<td>1</td>
<td>2</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>100kVA – 1 MVA</td>
<td>1</td>
<td>3</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>&lt; 100kVA and whole current</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
In addition NRS provides:
- Clear distinction is made between “meter” and “metering equipment”
  - **Meter** = device employed to measure and totalise the variable consumption of a electricity
  - **Metering equipment** = all components, including the meter making up the metering installation.
i) Interval and TOU metering systems

- Meters are also referred to as credit or post paid meters
- Traditionally – electromechanical technology
- Evolved functionality with advent of solid state technology
- Many extra service when compared to electro-mechanical
- Offering a wide range of possibilities
- Can form part of a complex metering system
- Services benefit utilities and consumers
- Traditionally for commercial and industrial installation (Large Power Users)
Load Profile

- Record of time stamped consumption data every integration period (30 minutes in RSA)
- Allows for the analysis and the definition of a "customer’s consumption pattern"
- Determine most effective billing algorithms
- Provides information about the loading of the electric system and input to the forecast of the energy request
- Status’s’s recorded to provide network information and events experienced
TOU (Time-of-Use)

- TOU tariffs take into account definite time slots or integration periods
- each of 30 minute duration during the day
- days during a month using holidays, workdays and weekends
- months constituting the low and high peak seasons
- Modelling the outcome of applying alternative TOU tariffs is made possible with the availability of load profile data
Monitoring and Service Interruption

- Monitoring allows for optimum management of distribution networks
- Assists with reduction of losses in line and service interruptions
- High-end meters provide real time recording of number of instance and duration of electrical service breakdowns
- Assist the utility to know cause of the problem before sending service teams to fix it
Services offered (4)

Interface with the SCADA and Control Systems

- Measured parameters communicated to a SCADA (Supervisory Control and Data Acquisition) or control systems
- Actual measured quantities, weighted pulses or parameter status indications
- These control systems used on the electrical grid to make control and forecasts of load demand
AMR systems (1)

- AMR = Automated Meter Reading
- Automatically collecting data (consumption, diagnostic, and status) from metering devices
- Store in central database
- Purpose: billing, troubleshooting and analyzing
- Saves periodic trips to read a meter
- Billing accurate as near real time data used (no estimation)
- Availability of data allows utilities and customers to manage electric energy consumption
- Various communication options enabling AMR
1. AMR system ownership
2. AMR Hosting is a back-office solution
   - Track electricity consumption over the Internet
   - Data stored in a centralized database
   - Use web application to analyze data with various online analysis tools

Executive Major of Ekurhuleni Metropolitan Municipality, Clr Ntombi Mekgwe: “…. internet based metering will be extended to include every demand meter in the City ….”
ii) Prepayment metering systems

- Use prepayment meter for various reasons, including reducing the non payment for services.
- Requires the customer to make advance payment before electricity can be used.
- If credit is exhausted then the supply of electricity is cut off by the meter.
- Customer has a visible indication of consumption and credits left.
- Meters recharged by entering a unique STS encoded 20-digit number using a keypad.
- Various technologies available.
iii) AMI systems

- AMI = Advanced Metering Infrastructure, often referred to as Smart Metering Systems

- AMI consists of the various system components, including:
  - Smart meters and associated equipment
  - Load control infrastructure
  - Modems, communication networks and other communication infrastructure
  - Management system and IT infrastructure

- NRS 049 gives guidance
NRS 049 Typical Arrangement
AMI – influences drawn

Conventional Metering

AMI (Smart Metering Systems)

Prepayment Metering

AMR Systems (Remote)

Communication

Load Control
What is a Smart meter? (1)

The **SMART METER** is a generic term for meter with:
- Bi-directional communication
- Both conventional (credit) and prepayment modes
- Keypad (STS token entry and information/status)
- Remotely accessible (reading and configuration)
- Remote disconnection and reconnection
- Dynamic tariffs
- Customized demand control strategy
- Anti-tamper management
- Remote-Vending and Self-Vending based on STS
- Integrate to distribution automation systems
Advantages of AMI System

- Remote meter reading
- Remote- and Self-Vending based on STS possible
- Data analysis and Vending report (management)
- Comprehensive line losses analysis management
- Anti-tamper management
- Remote disconnection and reconnection via manual and automated algorithms
- Customer service and interface to Billing System
- Customized demand control (local and remote)
Conclusion

- Numerous technologies to choose from
- Each technology has its place in the scheme of the metering environment
- Cost justification to determine most suitable solution
- Integration between systems are more achievable than before, thus allowing integrated solutions
- No one technology answer
We are going with you!!!