The implementation of Automated Meter Reading (AMR) at Tshwane

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Automated Metering Infrastructure (AMI)

- Automated Metering Infrastructure / Reading (AMI/R)
- Broadband Power Line (BPL) communications enabled AMR meters
- Case study : AMR-BPL enabled meters implementation at Tshwane

- Distribution & Auxiliary equipment

Automated Metering Infrastructure (AMI) - Background

- Automated Meter Infrastructure (AMI) - uses smart meters and auxiliary network equipment for an automated system with metering & other services in real-time
- Smart meters – meters that use the Automated Meter Reading (AMR) technology
- AMI provides two-way data exchange

Automated Metering Infrastructure (AMI) cntd

- The auxiliary equipment used include the DCU, CIU, the electrical & wireless network, repeaters, lines etc.
- Regional control centers and a main control center for data collection and database management system / software
- Vending, Billing and export system
- Energy analyses & loss calculation

Features of an Automated Metering Infrastructure (AMI)

- Real-time metering functions including :
  - Electricity, Gas & Water meter readings
  - Load profiling & Event data
  - Remote Load curtailment / reduction
  - Remote cut-off/disconnection
  - Remote reconnection
  - Different Tariffs e.g. Time of Use (TOU) schedules
  - Condition Monitoring of equipment

Features of an Automated Metering Infrastructure (AMI) cntd

- AMI allows integration with Broadband Power Line communications
- Broadband PowerLine (BPL) features include:
  - Internet
  - VOIP
  - Internet TV
  - VOD
  - Security functions
  - Other Value added services

Automated Meter Reading (AMR)

- Smart meters using Power line Carrier (PLC) / BPL communication technology
- A Customer Interface Unit / Terminal (CIU / CIT) for display in the house
- Narrowband PLC communication
  - 95 kHz, between CIU, Meter & DCU
- RS 485 or M-bus meter connectivity

Automated Meter Reading (AMR) cntd

- RS232, RF, GPRS, Broadband wireless & Ethernet ports

- AMR meters features include remote :
  - Setting for operation mode as a Post-paid / Conventional or Pre-paid meter
  - Disconnection or reconnection of meter
  - Tamper Detection (Cover, wiring, bypass)
  - Water of gas meter interface etc.

Automated Meter Reading (AMR) cntd

- A Data Concentrator Unit (DCU) to collect the data from the meters in the mini-substation / Pole mount box
- Automated Meter Reading data collection software and database management software
- Load Management software – disconnection, reconnection, load curtailment etc.

Broadband PowerLine (BPL) enabled AMR meters

- Broadband enabled AMR meters use wireless (WiMax, Wi-Fi), GPRS/GSM communications to receive the broadband signal (2.5-3.5 GHz,2.4 & 5.15 GHz)
- or receives the broadband signal from electric power line with the Broadband PowerLine (BPL) enabled AMR meter (2 – 30 Mhz)

Auxiliary Equipment for AMR

- RF / GPRS / Wireless ports
- Data Concentrator Unit
- Routers
- Couplers / Bridges
- Repeaters
- Household Filters

Case Study – City of Tshwane

- **Background**
- Billing queries, account queries and disputed meter readings by customers
- Top Management of the electricity department mandated after meetings with the Municipal Manager, the Chief Financial Officers and other committees to conduct a Proof of Concept , pilot and implement the Automated Meter Reading (AMR) technology

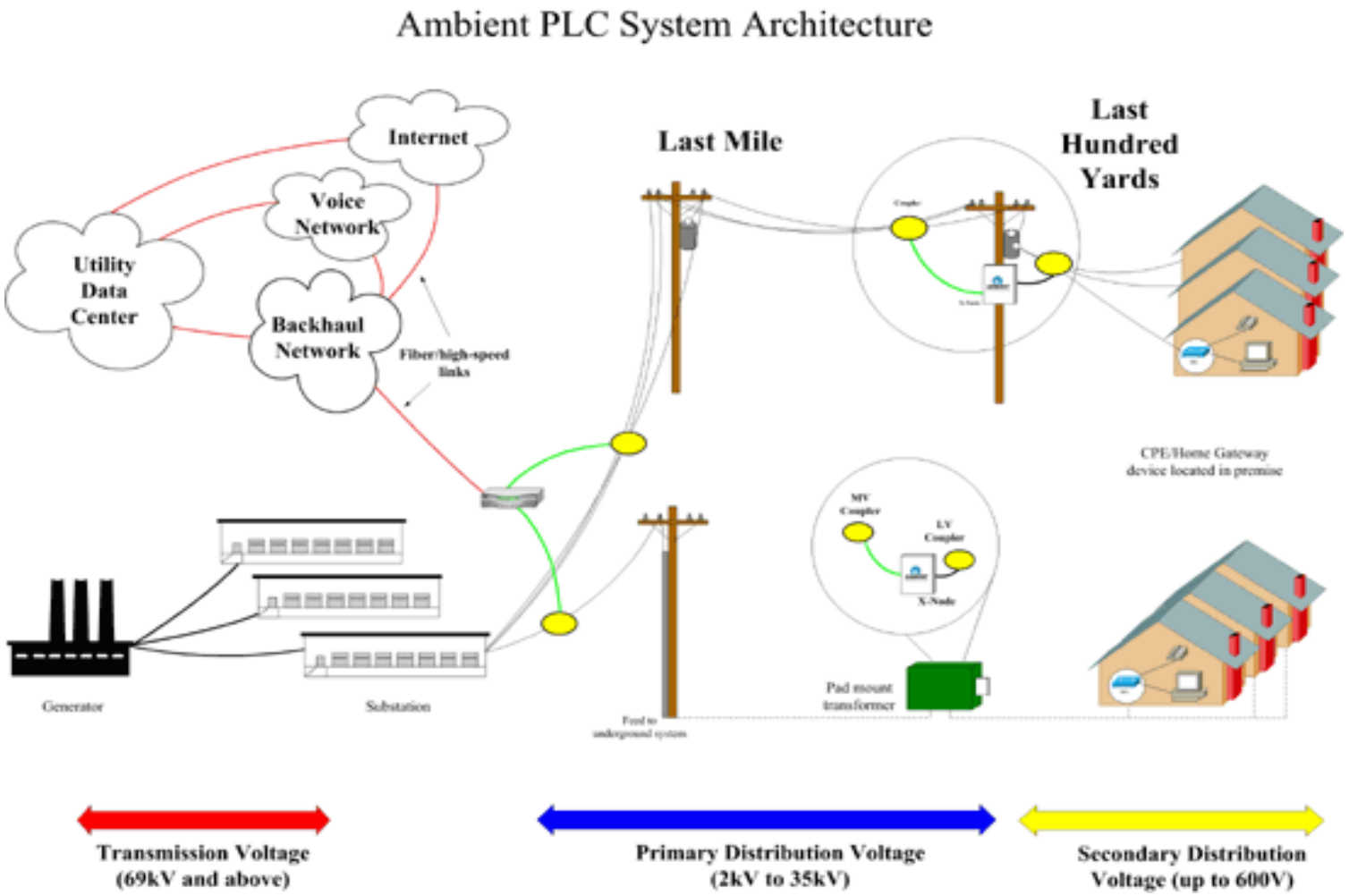
Case Study – City of Tshwane cntd

- **Implementation**
- The AMR technology will provide accurate meter readings on real-time and provide other metering features
- Nr. of customers 460,000 , 20,000 AMR ready meters currently in the network
- Electric network (lines & cables), an optic-fiber network and radio high sites

Case Study – City of Tshwane cntd

- Proof of Concept (PoC) was conducted for 1 year to prove the technology of AMR on a live electric system
- PoC done by suppliers and City of Tshwane and facilities hosted by EDI
- Tender process is continuing

Typical Network



Effects of AMR on Business Processes at CoT

- Change in internal policies
  - Financial
    - Debt recovery
    - Debt collection
    - Cut-Off & Reconnection notices delivery
    - Exception reports
  - Operational
    - Retraining of staff
    - More maintenance activities & planning

Effects of AMR on Business Processes at CoT

- Change in internal process
  - Operational
    - Meter cut-off, reconnection
    - Meter tamper reaction & network security services, real time tamper reports
    - Network control (load curtailment)
    - Network condition monitoring or network status – e.g. faults in real time ,phase loss

Effects of AMR on Revenue Management - cntd

- Meter Reading services
  - Remote meter reading implies meter readers retraining / placements in other sections
  - Meter reading portions to be reprogrammed for meter reading uploads for billing
  - Meter reading rounds schedule is minimized

Effects of AMR on Revenue Management - cntd

- Revenue Protection
  - Meter tamper information in real-time (Meter box, meter cover & metr terminals)
  - Meter programming can be checked remotely for billing factors, CT ratios etc.
  - Energy balance can be determined (energy supplied – energy metered = Non-Technical losses per mini-substation area/substation)

Effects of AMR on Revenue Management

- Credit Control (CC)
  - Credit control process affected by AMR through
    - Load reduction / curtailment (Policy)
    - Remote disconnection
    - Remote reconnection
    - Remote water meter restriction
  - Timeous updating of customer information of payments / arrangements for customers in the credit control process

Effects of AMR on Revenue Management - cntd

- Revenue Collection
  - Remote cut-off
  - Remote reconnection
  - Recover arrears when customer buys or pays for electricity by using AMR curtailment or disconnections
  - Timeous update of account payments of blocked / curtailed meters

Effects of AMR on Revenue Management - cntd

- Energy Management
  - Real-time energy information can be used to
    - Determine supply side power requirements (own CoT Power Station's generation)
    - Perform load curtailment instant of load shedding
    - Determine the load profile per area & curtail specific area and not overloaded areas
    - Energy highs and lows per mini-substation area / Substation

Advantages of AMR

- Advantages
  - Data / Information on the network condition
  - Energy analyses & loss calculations
  - Real time energy information
  - AMR and other value-added services
  - (Power quality, load management etc.)
  - Can be a new marketing or advertising source through CIU/CIT displays in customers homes
  - Uses the utilities current infrastructure

Challenges AMR

- Challenges
  - Costs
  - Slow Technological advances
  - Legislation and regulations
  - Standards
  - Attenuation etc.

Conclusion

- AMR is a viable solution to enhance Revenue management (Revenue Collection, Revenue Protection and Credit control)
- AMR provides real time information that a utility can use to control and manage its energy requirements
- BPL in AMR adds features which enhance the AMR system

Typical Network