



An update of the AMR project at Tshwane

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City of Tshwane – We are the same

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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) 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 or 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
- Others

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 490,000+ , 20,000+ AMR ready meters currently in the network
- Electric network (lines & cables), an optic-fiber network and radio high sites

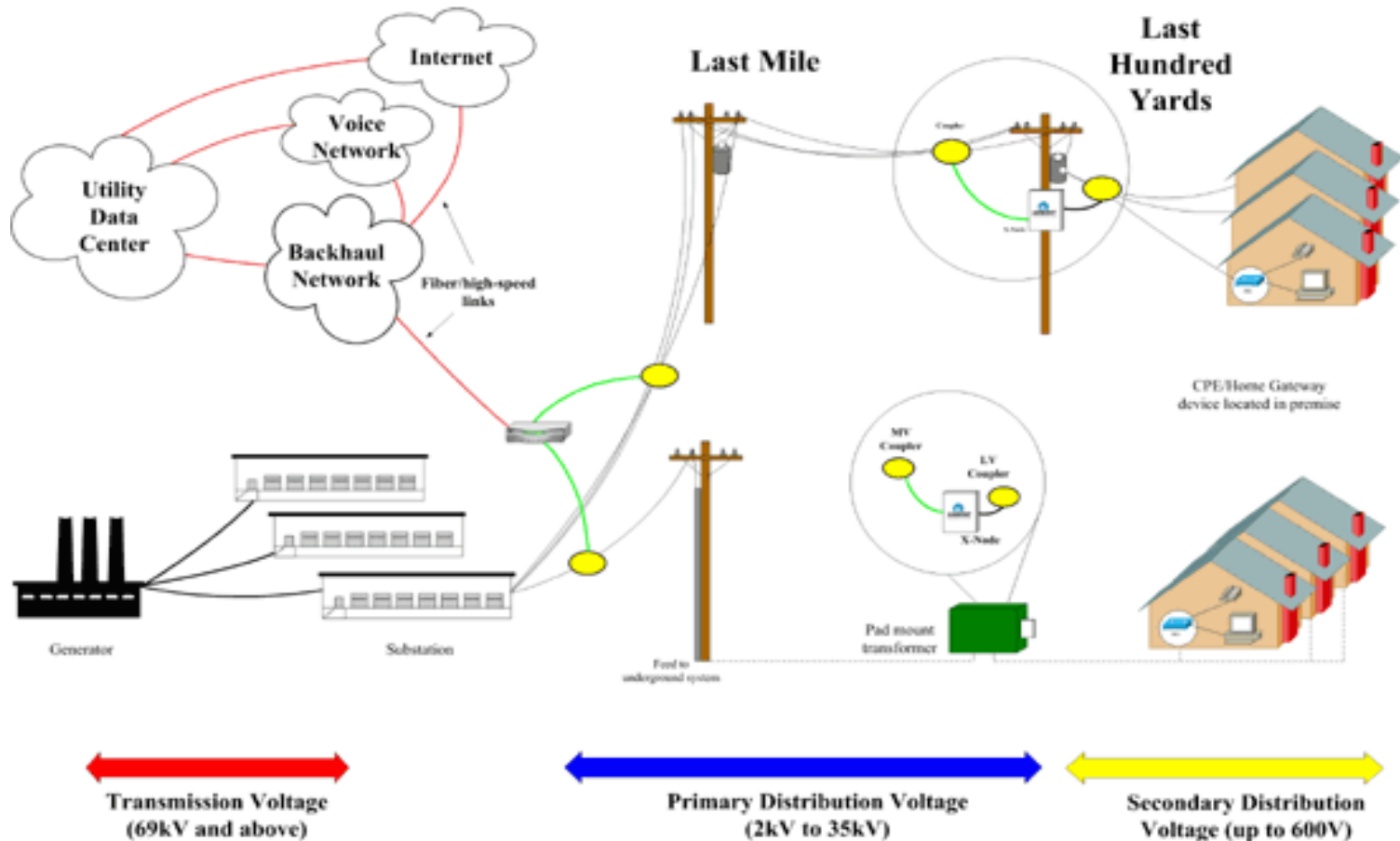
Case Study – City of Tshwane

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 in continuing, tender evaluation remaining and then the supplier(s) will be appointed

Typical Network

Ambient PLC System Architecture



Advantages of AMR

- Advantages of BPL enabled AMR meters
 - ✓ 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

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
 - Meter reading collection
 - Meter cut-off, reconnection

Effects of AMR on Business Processes at CoT

■ Change in internal process

➤ Operational

- Meter tamper reaction
- Network security services, real time tamper reports by the AMR system
- Network control (load curtailment)
- Network condition monitoring or network status – e.g. faults in real time ,phase loss

Effects of BPL on Transmission and Distribution

- Effect of BPL on network equipment
 - Lines
 - Transmission lines – High frequencies on lines at High voltages
 - Distribution lines – High frequencies on lines at High voltages
 - Other network equipment & Switchgear
 - Mini-substations – space to fit DCU
 - Ring Main Units (RMU) or RM6

Effects of BPL on Transmission and Distribution - cntd

- Effect of BPL on network equipment
 - Equipment additions
 - Routers
 - Couplers
 - Repeaters
 - Household Filters

Effects of BPL on Transmission and Distribution - cntd

- Effect of BPL on network equipment
 - Costs
 - New equipment required
 - Maintenance costs
 - Network Re-Engineering costs
 - Network Stability
 - Noise & Harmonics

Effects of BPL on Transmission and Distribution - cntd

- Effect of BPL on network equipment
 - Operational changes
 - Change in Maintenance plans
 - Change in Maintenance schedules and projections
 - Power Quality – Harmonics, Noise, Backfeed signals

Advantages / Disadvantages of AMR

□ Advantages

- Data / Information on the network condition
- Energy analyses & loss calculations

□ Challenges

- Cost
- Attenuation etc.

Conclusion

- Automated Meter Reading and Broadband PowerLine communications affects the Transmission and Distribution
- AMR BPL will have cost implications
- AMR BPL will necessitate operational changes

Typical Network

Ambient PLC System Architecture

