Agenda

- Smart Grid Enablement (SGE) Programme
- Project background
- Challenges
- Lessons learned
- Questions
Smart Grid Enablement (SGE) Programme

• The SGE programme manages new and emerging technologies and initiatives that enable the next generation distribution electricity grids,

• These technologies are seen as enablers of next generation utility grid, that is, SMART GRIDS.

• SGE Projects:
  
  • Advanced Metering Infrastructure (AMI) Project – previously referred to as the Homeflex Project.
  
  • Utility Load Manager (ULM) Research Project.
  
  • Soweto Split Metering Project.
Key Drivers

Comply with National Regulations
- National regulation mandates the use of smart systems and time-of-use tariffs for customers consuming over 1000kWh per month by 2012. Reg. 773

Shift load
- Shift load of medium to high (500kWh/month) residential consumers (LSM 7, 8, 9) through TOU tariff from the morning peak period and the evening peak period

System Emergency Load Limiting
- Load limiting of non-essential appliance load during system constraints/emergencies intelligent distribution network & smart meters. Approved by Board IFC (Mar 2008)

Change customer behavior with Pricing Signals
- Incentivize the efficient use of electricity, power conservation through TOU tariff to promote lifestyle changes. Approved by Board IFC (Mar 2008)

Maximize Operational efficiencies
- Achieve improved billing accuracy through automated reading, Call Centre costs through lowering customer bill enquiries, & on-site maintenance costs through remote diagnosis metering Infrastructure capability

Lower Economic Cost Options
- Enable a comprehensive & cost-effective DSM strategy to meet the continued increase in Eskom’s peak demand and capacity requirements.

Implement a National solution
- Roll-out to Eskom’s residential market thereafter to municipalities

Increase profitability
- Reduce Eskom’s distributor purchase costs thereby increasing profitability through load shifting

Provide value added customer services
- Provide new services & value adding options to meet customer increased need for flexibility & lower costs

Demand Response Strategy
- Smart solutions compliant to Eskom metering and residential load management requirements. (ICAS 18/04/2011 presentation)
Key Eskom Requirements

- Implement residential TOU tariffs.
- Implement Load Limiting Capabilities.
Project Overview: AMI Project Journey

Since 1995
Eskom’s Residential Time-of-Use (TOU) Tariff journey has begun.

In 1998 - 2003
Eskom embarks on pilot projects to test the TOU tariff called HomeFlex.

In 2005
A Request for Proposal (RFP) is issued to invite vendor proposals for AMI solutions.

In 2006
RFP responses are evaluated and three solutions are selected for Proof of Concept (PoC). The PoC reveals strengths and weaknesses among the participating vendors.

In 2007
AMI Metering business case is updated with the PoC results.

Jan 2008
Early 2008 Cabinet approves interventions to address electricity shortage, these included PCP and AMI Metering.

March 2008
Electricity Regulation Act which mandates that all customers consuming above 1000 kWh be on TOU tariffs not later than 2012 is gazetted.

Board IFC approved the project to implement Eskom’s 120 000 Customers within 24 months.

Apr 2010
ICAS Approval to time, scope and budget extension

Feb 2009
Updated Meter Vendor RFP ready to be issued to market.

Late 2008
Industry drafted and accepted NRS049 is published by SABS to ensure uniform AMI installations in South Africa. This forces Eskom to re-issue the 2005 RFP.

November 2011
AMI Meters Operational and integrated to Eskom’s back-end systems for ERA Phase 1 (TOU Billing; Load Control per Schedule)

September 2010
Commence installation /deployment of 10,000 AMI Meters at selected sites
AMI Project Scope/Approach

- Procure through an open tender process a solution which includes smart meters, appliance control devices, customer interface units, data concentrators and master station (multiple vendors).

- Solution requirements are based on the industry specification for Smart Meter, NRS049:2008, Advances Metering Infrastructure (AMI) for Residential and Commercial Customers.

- Install 10,000 meters to single phase customers Small Power Users (SPU) in Phase 1 in 3 Eskom regions.
  - The remaining 110,000 customers will be part of a future release (ERA Phase 2).

- Analyze the Process and Technology impacts to embed the technology into the business.

- Recruit targeted customers to signup to the Homeflex Tariff

- Implement a simplified master station integration layer during Phase 1. In parallel go out on open tender for COTS Gateway and Meter Data Management System (MDMS)

- Conduct lessons learnt in preparation for the next Phase/s.
AMI Solution Overview

- **Owned by the Meter Vendors** for phase 1A
- Uses GPRS to communicate between Concentrator and Master Station
  - Managed by Meter Vendor
- Meters communicate to the Concentrators using Powerline Carrier (PLC) technology
- Concentrators owned by Eskom
- ACD used to control non-essential appliances, such as Geyser, etc
- Eskom owns the meter, display unit and ACD
- FLAT File Integration in Phase 1a
- Enterprise AMI ESB Integration with Meter Vendor Flat Files
AMI Project Phases

Current Phase Scope

Phase 1 (a)
- Meter exchange
- Automated Meter Reading
- Tariff Transition
- Appliance Control Scheduled

Phase 1 (b) via Interfacing
- Meter exchange
- Automated Meter Reading
- Tariff Transition
- Appliance Control Scheduled
- Robust interfacing and routing

Phase 2 – MDMS and Gateway
- Load Control on Demand
- MVIL Tactical Reporting
- Malfunctions/Outages/Tampers
- Remote Disconnect/Connect
- Meter reading on demand
- Customer information delivery

Future Scope

Go Live - End March 2011

Phase 1 (b) via Interfacing

Go Live - 31 Oct 2011

Phase 2 – MDMS and Gateway

TBD

Current Phase Scope

- Kick-start field deployment (critical path)
- 1,000 meters in Central (Sandton - Buccleuch, Kelvin, Morningside, Sunninghill)
- Both meter vendors in same region and close to project team
- Learn & refine (solution & processes) from controlled deployment
- Comply with vendor contracts

Future Scope

- Roll-out all Phase 1 meters
- Remaining 2,200 in Central; 3,400 in Western (Tableview) and 3,400 in Eastern (Margate) – Total of 10,000 meters in urban sites only
- Implement processes for Phase 1 business capabilities
- Eskom is partially involved in operating the solution

Go Live - 31 Oct 2011

Future Scope

- Roll-out all Phase 2 meters (110,000)
- MDMS and COTS Gateway
- Implement end-state processes for Phase 2 business capabilities
- National roll-out (urban and rural customers)
- Eskom will own and operate solution (end-to-end)
### Phase 1a Applicable Use Cases

<table>
<thead>
<tr>
<th>Function Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>• Meter exchange</strong></td>
<td>This function defines initiating and performing a successful AMI meter exchange. This includes the necessary manual feedback data required to update the meter to service point (SP) link within CC&amp;B.</td>
</tr>
<tr>
<td><strong>• Automated Meter Reading</strong></td>
<td>This function defines collecting AMI meter readings from the meters and uploading of the readings into CC&amp;B for billing via the Meter Vendor’s Master Stations. This includes both normal and TOU meter readings.</td>
</tr>
<tr>
<td><strong>• Tariff Transition</strong></td>
<td>This function defines the process of converting a customer from the current tariff to the TOU (AMI Homeflex 4) tariff.</td>
</tr>
<tr>
<td><strong>• Appliance Control – TOU</strong></td>
<td>The load control schedule controls the time periods when the customers’ appliance control devices will switch off the pre-selected non-essential devices (e.g. geyser and swimming pool pump, etc). The schedule is linked to the TOU tariff peak periods.</td>
</tr>
</tbody>
</table>
Impacts to Field Services

• Installation
  • New Field Devices
    • Data Concentrators (DC)
    • AMI Meters
  • AMI Meter Supplier contracted to install AMI field devices
    • Pre-site Visits – Accompany vendors on Pre-site visits
    • Meter Exchanges – Accompany vendor on meter exchanges to better understand the installation process

• Maintenance
  • Field Services will provide first line support for all AMI Field Devices. EDFS will provide second line support.
  • Meter Vendors are being requested to provide proposals for second line support for all AMI Field Devices FS and EDFS teams are required to be trained
• **Storage of AMI spares** – AMI Meters, Display units and Appliance Control Devices

• **Storage** of returned **Appliance Control Devices** that are in a good condition.

• **Installation Process** – Work Orders to be created for Field Services staff who will be accompanying the Meter Supplier on certain installations (for training purposes only)

• **Meter Movement Management** – Capture the AMI change-outs on MATS, support customer service to capture change-out into CC&B.

• **Malfunctioning meters and concentrators** – receive a report from the Meter Supplier of malfunctioning meters and concentrators and create work orders.

• Meter Supplier will require the **keys** to the transformer, stubby and kiosk boxes.
Challenges

- **Customer impact**
  - Reduction of targeted customer base due to conversions to prepaid – attributed to high IBT charges & therefore customers convert to prepaid meters because they want more control over their bills.
  - Access to customers to attend forums and to install CIUs and ACDs inside their homes.
  - All customers in the targeted areas were interested in the tariff and technology, including Sectional title customers and three-phase customers. This raised some expectations for those customers not targeted.

- **SABS Test**
  - Delays from SABS to issue test reports and certificates. Eskom can only installs SABS approved products

- **Testing of web services integration layer**
  - Testing with 2 vendors – logistic challenge
Lessons Learned – Field Engineering

- Customer selection can be difficult due to inconsistency or incomplete data stored in CC&B (e.g. address lines, CNL, etc.)
- Outage Booking – requirement to book outages 35 days in advance requires a large lead time
  - Incorrect feeders/transformers (mix-ups)
- Space constraints in Minisubs/kiosks to support new devices (DC, ACD Transmitter, etc.)
- Physical state of Transformer Kiosks (Ant mounds)
- Quality of installations
  - Tools; Grommets
- Region to procure / order the Eskom’s meter movement books to be utilized during the installation
- Provide Field Services with the new AMI meter serial numbers / barcode to capture into MATS
- Contractor IDs and Magnetic boards must be ordered in advance
Lessons Learned – Customer Services

• Customer Services

• Plan for resources to capture Meter Change Outs in CC&B (potential for regional backlogs)

• Plan for data correction as a result of Customer Interaction and Marketing

• Dedicated customer services teams may be required to ensure that data is captured correctly in all systems.
Lessons Learned – Customer Interaction & Marketing

• Basic communication about the projects to customers is required as early as possible.

• Reliance on the Chairman of the Home Owners Association to communicate with customers (neighbours) – customer forums, outages etc:
  • Some complexes are not run optimally, miscommunication does occur where the information from Eskom does not filter through to the residents of the complex.
  • May reflect badly on Eskom; the mitigation should be for Eskom to get more involved (hands on) and send out “Connects” for installations per complex.

• Ensure that the local councillors are involved from the start.

• Customer forums:
  • Eskom must have a collective voice when seeing customers
  • Meter vendors should not be invited to customer forums

• Project activities and communication with Walk-in Centre and Contact Centre staff must be on-going during installations

• Need for FS to advise of changes that may affect interaction with customers on an ad-hoc basis
• Resistance to change (internal & external)
• Marketing is difficult due to the fact this is a targeted customer base and Eskom cannot go on a large scale marketing campaign so as not to raise expectations
• Singing customers up on the Homeflex tariff – only to implement after winter season because the prices are extremely high during this period
• The roll out of the AMI solution affects role players across all the value chains; i.e. from field services to IT and customer services
• Customer confusion due to the fact that there are 2 types of meter suppliers with two different looking devices with the same features
• AMI roll out is a learning curves for meter installations, appliance control device and customer interface units for both Eskom and suppliers.
• Lag between meter change outs and updating of customer information in the billing system. Don’t underestimate this process.
• Data issues
Some Considerations for AMI Implementation

- Meters and applicable devices must me properly tested in advanced. Consider Accelerated Life Test (ALT).
- Meters must have been properly calibrated – calibration certificate per meter.
- Installers must be experienced and authorised as per utility requirements.
- Appoint internal inspectors/auditors to inspect completed installation regularly.
- Develop AMI technical skills internally, if possible before project implementation commences.
- Have contingency budget for the project for:
  - Meter and concentrator boxes,
  - Three phase installations
  - Extra Concentrators
  - Unknown customers
- Have a well defined plan to handle change outs.
- All installations issues must be rectified when installations are done
  - e.g burnt terminal blocks, burnt wires, loose connections, etc.
# AMI Project KPIs

## Achievements

<table>
<thead>
<tr>
<th>Achievements</th>
<th>Phase 1 Target</th>
<th>Previous Total</th>
<th>This week</th>
<th>Total to date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Concentrators installed</td>
<td>167</td>
<td>21</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Meters installed</td>
<td>10 000</td>
<td>880</td>
<td>0</td>
<td>880</td>
</tr>
<tr>
<td>MMF captured in CC&amp;B</td>
<td>10 000</td>
<td>800</td>
<td>0</td>
<td>800</td>
</tr>
<tr>
<td>Customer interface units installed</td>
<td>10 000</td>
<td>177</td>
<td>0</td>
<td>177</td>
</tr>
<tr>
<td>Appliance control devices installed</td>
<td>10 000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

## Achievements

<table>
<thead>
<tr>
<th>Achievements</th>
<th>Presented to date</th>
<th>Presented previous week</th>
<th>Number of customers reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Forums (events)</td>
<td>7</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>Customer conversion to TOU tariff</td>
<td>10 000</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Questions / Discussion