The Key Success Factors for Implementing Prepaid Electricity System by NEC in Sudan

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Sudan area is about one million square mile population about 40 million (NEC) connection about one million.

The installed capacity is about 1250MW

It will be 15000 MW in the year 2028.
Purposes of Implementing Prepaid System

Ten years ago the National Electricity Corporation (NEC) began to replace the conventional billing system by prepayment system to help in the followings:-

- Reducing losses due to fraud (conventional meters are accessible)
- Improving the accuracy of the meter (mechanical deterioration)
- Reducing the running cost of the conventional meters
- Avoiding the difficulty of collections in rural areas
- Reducing the arrears
- Improving cash collection
- Avoiding wrong meter reading
- Achieving good relationship with the customers
Choosing the Technology:

• From several technologies in metering system NEC chose the prepayment system as a solution.
• NEC contacted several companies and after investigation chose keypad instead of magnetic and smart card (Easy to use, remote purchasing e.g SMS, IVR)
• Most of the Consumable elements you can find it in local market
• So easy for the customers to deal with.
Comparing The technologies

Keypad

✓ Token generated in paper
✓ Reproducible token at any sale point
✓ No token acceptor in meter
✓ No token acceptor in vend outlet
✓ Telephone vending possible
✓ Internet vending possible
✓ More care of customer is not required
✓ 20 Digit code
✗ One way communication

✗ Token generated inside card
✗ Token must be replaced by supplier
✗ Meter requires token acceptor
✗ Vend outlet requires token acceptor
✗ Telephone vending not possible
✗ Internet vending not possible
✗ More care of customer is required
✓ Convenient way to transfer credit
✓ Two way communication in some cases
Pilot Project:

NEC selected an area based on the following criteria for the pilot project:
1- The team work selected Riyadh city (in east Khartoum, 4500 meters installed)
2- High consumption range
3- High commercial Losses
4- Specific number of customers
5- Total arrears (CONSUMPTION OF 5 MONTHS)
6- The distribution network is good
7- The level of the customers education is high
Advertising

- We surveyed area project, collected the data and informed the customers with the new changes
- For the customers who did not respond to our initial approach, we sent letters for more details
- We used the Televisions and radios as a media for communications with customers
Project Management

We designed new technical follow up procedures. We began to replace the meters of key man person customers (ministers, high ranking staff, NEC staff ..etc.) After that we found no difficulties to replace the meters for other customers. After the installation of meter, there were monthly visits done by manager to the sites to check meter status.
Strong Audit Reports were designed to check non purchasing customer for specific days (30, 60, 90 ……)
The pilot project was run for two years, we made evaluation and found the benefits exceeding the expectations of the feasibility study.
In Mar 1999 system began in Khartoum East, (governmental area) and after that Amart and the rest of Khartoum State and all over Sudan
How does prepayment work?

- Consumer **purchases token** to their chosen monetary value, for the service (electricity)
- Consumer loads the purchased credit **into the meter** and receives service
- When **credit is depleted**, the consumer simply purchases a new token
- If no new token is purchased, supply is **disconnected** until a new purchase is loaded into the meter
Software and hardware

Meters which we are using is STS (Standard Transfer Specification) complaint

- STS ensures that tokens can only be used by the intended meter and can only be used once in that meter.

- High Level of Security
- Unique Key per Electricity Meter
- The software contains an effective reporting system which allows the engineers to manage all customers efficiently.
Training & Service

- Intensive training was given to NEC project staff
- Max. Technical Support from the supplier company
- System development whenever needed
- All equipment and tools for operation & maintenance are available in the local market.
Consumers Benefits:

- **Convenience** of purchase (places, methods, 24-hour)
- Customers manage their own **budget**
- **Visible credit** and consumption indication
- **Solves** landlord problems
- **Privacy** (meter readers do not enter the premises)
- Improved **relationship** with customers (no wrong reading, no disconnections and no reconnection fees)
Utility Benefits:

- Payment in advance (improved collection)
- Zero consumer debt (no arrears)
- Simpler and cheaper revenue collection cycle
- Reduced operational costs
- Commercial losses reduced
- Reduced electricity consumption
- No more unbalanced load due to disconnect and reconnect the customer
- No more Bills & Debt accumulation
## Percentage of Losses (2001-2006)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>LOSSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>44%</td>
</tr>
<tr>
<td>2002</td>
<td>36%</td>
</tr>
<tr>
<td>2003</td>
<td>30%</td>
</tr>
<tr>
<td>2004</td>
<td>26%</td>
</tr>
<tr>
<td>2005</td>
<td>20%</td>
</tr>
<tr>
<td>2006</td>
<td>15%</td>
</tr>
</tbody>
</table>
## Total GWH & Amount (2001-2006)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>GWH</th>
<th>Amount (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>1757</td>
<td>41164</td>
</tr>
<tr>
<td>2003</td>
<td>1928</td>
<td>44659</td>
</tr>
<tr>
<td>2004</td>
<td>2496</td>
<td>61463</td>
</tr>
<tr>
<td>2005</td>
<td>2988</td>
<td>75221</td>
</tr>
<tr>
<td>2006</td>
<td>3457</td>
<td>88399</td>
</tr>
</tbody>
</table>
Unbalance Load Correction

This study is done after replacement of traditional meters by pre-paid meters.

As a case study, in Kalakla town (third class region) there is a residential transformer 200 KVA, underneath there is a comparison after replacement of meters the load was balanced as shown:

<table>
<thead>
<tr>
<th>Before balancing</th>
<th>After balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Y</td>
</tr>
<tr>
<td>130</td>
<td>150</td>
</tr>
</tbody>
</table>
The second case is in El Riyadh town (first class region) residential area also transformer 1000 KVA

<table>
<thead>
<tr>
<th>Before balancing</th>
<th>After balancing</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Y</td>
</tr>
<tr>
<td>591</td>
<td>629</td>
</tr>
</tbody>
</table>
NEC Total Customer

Total Customer = 1,112,630
Prepaid Customers = 1,035,088
Percentage = 93%

Today, 1,035,088 Prepaid meters
  single phase 911,825
  three phase  121,733
  high current  1,530
Current Status

For customer satisfaction we implemented scratch system by SMS & IVR. (All over Sudan)
Now we have 14 offices in Khartoum area online vending they use scratch cards by SMS & IVR and they can vend cross selling (from any office) and we are discussing additional methods for services mainly for vending e.g remote vending, handheld POS, ATM, Merchants
POWER card benefits

- **Simple** yet effective mechanism to purchase electricity
- Seamlessly **integrates** into existing prepayment system
- Consumers use **cell phone** to purchase electricity 24/7
- **Reduced** cost for reaching point of sales
- Available **near** the customers
- Reduced infrastructure, personnel and operational **costs**
- Shrinkage and **theft** is eradicated
- **Revolutionising** the industry
- Empowering **job creation**