Case Study: Smart Grid In Indian Utilities

June 5th, 2017
Agenda

- Issues in utilities
- Solution
- Placement of sensors and communication
- Data analytics
- Process Change
- Benefits
- Capacity Building
- Challenges
- Enabling Measures
- Way Forward
Issues in Utility

- Manual meter reading, Data entry, and collection System
- Revenue loss
- Customer Dissatisfaction
- Manual Connection and disconnection of defaulter
- Law and order problems
- Defaulter continue to get supply
- Incomplete information about the utilization of assets
- Overloading of the infrastructure
- Operational inefficiency
Solution – Smart meter architecture

- Data exchange Protocol as per IS 15959
- Metering as per IS 13779 with anti-temper feature
- Load Switch as per IS 15884
- Communication Module
- RF/PLC
- GPRS/OF
- DCU
- Optical Port
- HES/MDAS
- GPRS

Indian Standard 16444
Solution – Advanced Metering Infrastructure

• Smart Meters connected to the control centre via a DCU. Facilitates real time:
  – Load curtailment – load switch in meter
  – Tamper alert
  – Push / pull of energy usage information
  – Remote firmware upgrade

• Smart Meters communicate to control centre using:
  – RF (free band 865-867MHz & 2.4 GHz)
  – PLC
  – GPRS
Solution – OMS

✓ Distribution Transformer Monitoring Systems (DTMS) installed to monitor healthiness of the DTs
  o Oil temperature
  o Oil level
  o Winding Temperature

✓ Fault Passage Indicators (FPIs) (communicable / non-communicable) have been installed, receiving alerts at SGCC as well as mobile phones of maintenance crew

Oil and Winding Temperature
Solution – Snapshot of Installation

Smart Meter
DT METER
Gateway for FPI
SGCC
DCU
Street Light Automation

Solar power for FPI Gateway
Placement of sensors and Communication

Data Flow
- From DCU
- To DCU
Data Analytics
Data Analytics
Process Change

- Billing Through Automatic Remote metering
- Better asset utilization – DT augmentation upward as well as downward
- Realistic upgradation of consumer sanctioned load
- Remote load connection disconnection
- Redeployment of meter reader
Benefit to Utility

• Reduction of AT&C losses
  ✓ Metering Efficiency increased by 14% through smart meter in one of the pilot location

• Online energy accounting & auditing, tamper detection and system load analysis
  ✓ Online Energy Audit was conducted at distribution transformer level.
  ✓ Better understanding of system load profile to design DR programs

• Improved Load Management
  ✓ Optimal utilization of assets – deferment of capacity addition
  ✓ Avoidance of blackouts & purchase of expensive peak power

• Improved Power Quality of supply
  ✓ Average hourly power factor per day after VAR compensation: 0.99
  ✓ Harmonic suppression
Benefit to Utility

- Reduced outage time & frequency
  - Increased revenue
  - Improved quality and reliability of supply

- Crew and asset management
  - Faster Identification of fault
  - Speedy power supply restoration
  - Improved asset quality & life by remote monitoring of health & undertaking preventive maintenance

- Street light automation
  - About 57% saving in energy consumption in one of the pilot location

- Renewable Integration & Net Metering
  - Facilitate penetration of renewable energy in the grid
  - Net Zero energy: Facilitation for prosumers to inject renewable energy back to grid
Benefit to Consumers

- Consumer Engagement & empowerment with greater control over their energy use and bill
- Improved quality & reliability of power supply
- Increased life of appliances and gadgets due to improved power quality
- No investment in power backup solutions like inverters and Gensets
- Rooftop renewable generation with facility to feed excess power into the grid – Net Metering
- Improvement in overall consumer satisfaction
## Capacity Building

*Delegates from the following organizations visited the pilot project:*

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<td>NITI AYOG</td>
<td>Syracuse University, New York</td>
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Challenges

- Drafting of specification as per prevailing utility practice
- Getting the BIS marked smart meter
- Selection of communication architecture
- Interoperability
- Type testing of Meter
- Placement of DCU
- Consumer resistance
- Dynamic Nature of Distribution Network
- GPRS Signal
- Integration with Existing R-APDRP system
- Regulatory Issues
Enabling Measures

- AMI functional specification released by CEA
- Standard for Smart Meter: IS 16444
- Standard for Communication: IS 15959 Part II
- Four NABL labs are ready for testing as per IS 16444
- Sufficient no. of manufacturers are available for smart meters
Way Forward

- Mass Roll out
- Development of strong policy framework
- Development of enabling Regulation
- More consumer awareness program
- Development of self sustainable business model
Thank You

Hemendra Agrawal
DGM, Smart Grid
Power Grid Corporation of India Limited
hem@powergridindia.com