GIS Implementation in Power Distribution Companies in India - Learnings and Experiences

By
A K Shrivastava
AGM (IPDS) PFC
Power Distribution Company ensures availability of electricity to end consumers.

It deals with HT & LT electrical networks and related consumers spread over wide geographical area.


In past, Discoms have been using conventional Physical Area Maps for proper O&M and management of the system.
However, over the years, DISCOMs have accumulated losses of approximately Rs. 3.8 lakh crore and outstanding debt of approximately Rs. 4.3 lakh crore as on March, 2015.

A gap of Rs. 0.87 in ACS & ARR in 2009-10 (ACS- Rs 3.55, ARR – Rs 2.68) and Rs 1.15 in 2013-14 (ACS- Rs 5.5, ARR- Rs 4.0).

Bottom six states on the basis of losses (accrual basis) registered during the year 2013-14 (Rs. Cr)-
Uttar Pradesh- 17,678, Rajasthan- 15,912, Tamil Nadu- 12,677,
Madhya Pradesh- 6,941, Haryana- 3,315,
Jammu & Kashmir- 2,219
The T&D losses were around 15% up to 1966-67, increased gradually to 23.28% by 1989-90 and 33.98% during 2001-02. However, it has come down to 32.54% during 2002-03 and 31.25% during 2004-05.

The AT&C losses have reduced from 36.64% in 2002-03 to 22.70% in 2013-14 (source: PFC 2013-14 annual report on Performance of State Power Utilities).
Reasons of High Losses

- Lack of automated systems for sustained collection of accurate base line data
- Lack of monitoring mechanism to measure effect of investments in terms of performance
- Non-adoption of IT in the areas of Energy Accounting etc.
- Low Customer Satisfaction
- Inadequate Capacities
- Old and Fragile Sub-Transmission and Distribution System
- Outages & Interruptions
Reasons of high AT&C Losses

Technical losses-
- Overloading of lines and substation eqt, Old and outdated network, Low HT:LT Ratio, Poor repair and Maintenance of equipment, Non installation of sufficient capacitors, Poor power factor

Commercial losses-
- Defective meters, Tampering of Meters,
- Theft & Pilferage
- Poor metering / billing efficiency, Less/Non realization of dues against billed energy
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To address the issue, GOI intervened and took initiative under R-APDRP for establishment of IT system with extensive use of GIS for -

- Collection of baseline data & IT enabling of utility’s business procedure.
- IT based energy accounting/auditing
- IT based distribution network analysis & corrective measures for performance optimization.
- Set-up of customer care centres for improvement in customer satisfaction
- Establishment of SCADA/DMS system to improve Power supply reliability in major towns.
- Distribution system strengthening and upgradation by way of new installations/augmentation/refurbishment, etc
- Capacity building, Skill & proficiency enhancement of employees.
The purpose of GIS is efficient management of Power Distribution System and improving –

- Metering,
- Billing,
- Revenue collection,
- Network performance optimization, Reducing AT&C losses
- Regular O&M, Outage Mgmt., Asset Mgmt
- Future planning,
- Customer satisfaction, etc.
GIS maps becoming essential for better understanding of current status and future planning of network.

GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand patterns and relationships. Once we understand, we can prescribe action. This new approach to management, managing geographically, is transforming the way organizations operate.
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Scope of GIS in R-APDRP:

- Use of town area latest geographical map as base map (Satellite Imageries of sub-meter resolution of specific towns taken through NRSC, Hyderabad).
- Mapping of all assets (66kV/33KV/11KV, LT) including HT & LT network entities upto poles & major landmarks.
- Collection of consumers attributes through door-to-door survey and indexing with network assets.
- Overlaying of digitized electrical network & consumers on the base map with area features and attributes using SW for GIS application.
- Integration of GIS system with other IT applications
Challenges Experienced-

- Delay in Availability of Imageries.
- Non-availability of skilled manpower with GIS agencies for field survey.
- Capture of too many attributes,
- Huge errors in linking of assets, between assets & consumers, their attributes collection, etc.
- Slow progress in survey data validation by utilities due to manpower shortage, lack of coordination.
- Slow opening of GIS basemap on system.
- Delay in updation of incremental changes leading to inaccurate Energy Accounting.
- Lack of expertise with utilities for Post Go Live activities.
Utilities advised to -

- Take help of State Governments for hiring of people through State Labor Department/ITIs/Market Survey personnel for Consumer Indexing etc
- Deploy joint survey team comprising of ITIA and utility staff to address field related issue in survey and quick validation of same.
- Formulate process for updation of GIS database

Simplification -

- Simplification of GIS Map procurement forms of NRSC
- Simplification of GIS validation/acceptance process
- Optimization of survey parameters

Sharing of Best practices and guidelines with Utilities through workshops & review meetings.

Extensive & Regular Training of DISCOM’s manpower in GIS activities.
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DISCOMs to ensure –

a) Timely updation of incremental changes in network assets & consumers database for deriving benefit out of GIS solution.

b) Timely updation of GIS imageries.

c) Capacity building, Skill & proficiency enhancement of utility employees for managing Post Go Live GIS activities.

d) Reliable network connectivity for optimal use of GIS application.

Requirement of Apps for easy updation of networks assets, consumers & Base maps.
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### GIS Asset Mapping

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<th>S. No.</th>
<th>Discom Name</th>
<th>Total Towns</th>
<th>Total SS+Fdrs</th>
<th>Work In Progress/Taken up</th>
<th>Survey Completed</th>
<th>Submit by ITIA</th>
<th>Approved By Utility</th>
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### GIS Consumer Survey

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Thanks