

Increasing Efficiency

Distribution utilities adopt IT solutions in a big way

Power distribution utilities are significantly building additional layers of automation, communication and IT systems to achieve operational efficiency and reduce losses. In addition, analytics and integration of IT and OT have become a business necessity for these utilities. This has also been reflected in the recent findings of the Power Finance Corporation on the operational performance of 10 discoms where aggregate terminal and commercial (AT&C) losses have reduced in the past five years. Leading discoms share their views on the IT and OT deployment initiatives taken by them, their key challenges and future plans for expansion...

What have been the key areas of IT and operational technology (OT) adopted by the company recently?

Arup Ghosh

Tata Power Delhi Distribution Limited (TPDDL) has implemented almost the entire bouquet of IT and OT that usually contributes towards the creation of a smart grid. Specifically, TPDDL has implemented robust enterprise resource planning (ERP) (SAP R3 and ISU/CCS) systems which have enabled digitisation of approximately 300 business processes. ERP tackles all the financial billing/customer relationship management (CRM), asset management and a few outage functions.

TPDDL has also implemented a comprehensive supervisory control and data acquisition (SCADA) system, outage management system (OMS), geographic information system (GIS), energy management system (EMS), call centre management application, network analysis tool, workforce and field automation

systems, along with robust communications infrastructure. The company is now in the process of rolling out a communication canopy on radio and optic fibre along with advanced metering infrastructure (AMI) with two-way communication meters.

In addition to IT and OT, the company has also started relying on business analytics.

Praveen Goyal

The thrust of IT and OT initiatives has been on leveraging technology to enable Noida Power Company Limited (NPCL) to respond to the challenges of managing growth in a rapidly developing township by integrating the network, financial and customer information systems on a common platform. It provides the advantages of rapid access to in-process information, inbuilt process controls, workflow-enabled transactions, a "single version of truth" in an automated manner, and also support for timely strategic decision-making.

NPCL has strategically chosen a number of best-in-class technologies and implemented them successfully in order to provide better consumer connect and services and control the organisational processes to serve the ecosystem requirements. A few of the technologies recently implemented are:

Weather stations

- Commissioned at four geographically spread-out locations for effective demand forecasting and ensuring optimal power procurement.

Real-time monitoring

- Power drawal monitoring through transmission substations
- Solar generation.

Communication system

- Creation of a robust ring main communication backbone for offices and substations with integration of optical fiber cable (OFC) and radio frequency (RF) communication technology
- Office telephony system based on the centralised architecture principle,



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BSES

Surveillance system implementation

- Multiple office and substation location surveillance

Vehicle tracking system

- Locating important company-owned vehicles and a few hired vehicles for critical use.
- Ensuring traffic discipline, particularly speeding, etc.

The company decided on smart grid implementation in 2014 and articulated an implementable architecture over the years, giving priority to addressing a few of the immediate needs. Accordingly, the following initiatives are currently at the execution stage:

GIS

- All spatial information is available through linking with applications supporting critical business processes of the organisation
- Application to act as the fulcrum for information sharing and achieving integration
- Paradigm change in the processes to deliver speedy and error-free customer services
- Achieving unprecedented integration of various applications
- Providing web-enabled system and mobility for application for its enhanced usage

Advanced distribution management system (ADMS) and SCADA

- ADMS comprises distribution management system (DMS) and OMS. Works only on up-to-date GIS data
- Distribution network analysis, real-time insight, better consumer services through location-based analysis, crew deployment, etc.
- Substation automation – Control room engineers will be equipped with real-time data.

In addition, field area network (FAN) automation, an important cog in the wheel for smart grid implementation, is successfully tested, integrated and implemented for substation automation, 11 kV RMU motorisation and automation, 33 kV and 11 kV auto reclosure in conjunc-

“Using IT and OT has resulted in a dramatic improvement in efficiency, reliability of supply and customer satisfaction.”

Arup Ghosh

tion with load break switches, 33 kV and 11 kV communicable fault passage indicators, distribution transformer monitoring on a real-time basis and street light and high mast automation and control. This journey would continue for additional coverage over the years.

The company has also completed the implementation of SAP Syclo Work Manager, a mobile application that allows engineers working at the site to receive work orders, update orders with work status in real time and update the enterprise asset management database with a rich base of information regarding maintenance records, which can be mined to fine-tune installation and maintenance practices to improve network reliability. This mobile application will be integrated with the proposed OMS, so that customers enquiring about outages can be provided with an updated status of work being carried out to restore supplies.

Debashis Roy

CESC Limited has twin SCADA system/EMS/ DMS – one for the network at and above 33 kV and the other for the distribution network – with currently over 140 remote terminal units (RTUs) and several hundred FRTUs in service. The rather old master control centre/ backup control (MCC/BCC), which has served well all these years, will soon be replaced by a

“Field area network automation is an important cog in the wheel for smart grid implementation.”

Praveen Goyal

new smart grid control centre (SGCC). The RTUs, from different manufacturers, have been commissioned over the years encompassing almost all substations and distribution stations with associated regional control centres and the MCC/BCC.

The primary telecommunication system in CESC is on optical fibre which has been laid together with HT power cables for many years now. There are also some overhead and optical ground wire cables. Both synchronous digital hierarchy and Gigabit Ethernet systems serve as the communication systems over the extensive fibre optic network (“CESC Net”) which connects all generating stations, substations, distribution stations and major offices of the company.

CESC has over 30,000 m with AMR, covering all HT meters, LTCT meters and distribution transformers for street lighting. AMI trials over RF mesh, GPRS, microwave, programmable logic controller have been and are being tried out. A somewhat larger pilot over the RF mesh is being rolled out in a high-loss-prone area of the city. Over 2,000 static meters, with smart features over GPRS, in line with BIS have also been installed.

BSES spokesperson

By definition, IT and OT convergence is the integration of IT systems (used for data-centric computing) with OT systems that are used for monitoring events, processes and devices. It is also used for making adjustments in enterprise and industrial operations.

Conventionally, IT and OT have occupied separate spaces in the utility industry. The business needs, challenges and regulatory regime has made IT-OT convergence the need of the day. Integration of systems like SCADA, EMS, DMS, OMS and asset management with IT systems like metering, billing, customer services, ERP, GIS and business analytics has become a necessity for the utility business. BSES has well understood the need for focusing on IT-OT convergence to offer the best service experience to its

customers and consequently, identified the key areas in IT and OT adoption. These include:

Outage management: Managing outages in the shortest possible time is key to meeting the service expectations of customers. BSES has developed and implemented a GIS-based OMS to meet objectives like:

- Enhancing customer approachability for outage registration and keeping customers well informed about outages
- Enhancing real-time outage resolution and monitoring mechanism on GIS
- Generating meaningful reports for analysis.

Smart grid initiatives: BSES has also taken some smart grid initiatives to meet business challenges like:

- Implementation of smart grids
- Asset tracking, monitoring and maintenance – Tracking, monitoring and optimising asset performance like remote health monitoring of distribution transformers and planned maintenance of grid equipments.
- Demand response – Remote customer monitoring and managing demand with respect to supply availability (with smart meters and other sensors)
- Grid integration with renewables – Increasing penetration of renewables in the grid has created many challenges. On its part, BSES has initiated integration of solar rooftops and other renewables with the grid in order to balance demand and supply (smart meters and other sensors)
- Field workforce management.

Analytics: Utilities are generating a lot of data through IT and OT systems but are not able to interpret it meaningfully by correlating such huge data for business decisions. BSES has taken up analytics as another focus area and initiated the business analytics project.

What have been the key learnings and experiences?

Arup Ghosh

Using IT and OT has resulted in a

“CESC is automating RMUs at critical installations such as hospitals and pumping stations using FRTUs communicating over extended fibre optic transmission network.”

Debashis Roy

dramatic improvement in efficiency, reliability of supply and customer satisfaction. For instance, AT&C losses have reduced from 53 per cent to less than 9 per cent during the period after IT and OT were implemented. Similarly, reliability of supply has dramatically improved the system average interruption duration index (SAIDI) from over 1,000 hours to 30 hours and system average interruption frequency index (SAIFI) from 1,000 to 20.

The moot point is that adoption of these advanced technologies inevitably brings about operational improvements and customer satisfaction. However, the use of technology has to go hand in hand with business process re-engineering and organisational restructuring. Simultaneously, it is essential to develop in-house capabilities to manage and maintain these technologies. Reliance on outsourced skills to manage the technologies is not a sustainable solution.

“Integration of systems like SCADA, EMS, DMS, OMS and asset management with IT systems like metering, billing, customer services, ERP, GIS and business analytics has become a necessity for the utility business.”

BSES spokesperson

Praveen Goyal

In the implementation of IT and OT, including their convergence and integration, we have faced many challenges despite taking utmost care. Appropriate technology and vendor selection itself is a challenge, but it has also given us certain key learnings. In the case of single-party dealings, the chances of interparty conflicts and associated risks of delays in completion of the project get reduced, as compared to projects handled by a consortium. Availability of the requisite talent in the market, their continued association with the project/organisation with whole-hearted participation requires coaching and mentoring at all levels.

Another key learning is that one should adopt, as far as possible, the standards and standard solutions only where integration requirements are minimal. The other key learning is that it needs a concerted effort from all the departments of an organisation to complete the project as per the desired architecture.

Debashis Roy

CESC has over 5,000 ring main units in service. Several trials using GPRS (2G/2.5G/3G) and CDMA were carried out for communicating with FRTUs on the RMUs but poor throughput (less than 50 per cent at times) led us to abort the idea. Now, pending FAN, CESC is automating RMUs at critical installations such as hospitals and pumping stations using FRTUs communicating over extended fibre optic transmission network.

BSES spokesperson

The IT and OT journey of BSES has been quite long and we have learned quite a few things. Some of the key learnings are:

- Understanding the business requirements well and aligning technology as a tool to meet the requirements and not the other way round.
- New technology adoption is a long process and needs to be taken up with due diligence. It is always a good idea to go for technology pilots to evaluate the

- adoptability and scalability of the same.
- It is also important to understand and adapt to industry standards like device language message specification to avoid integration complications later.
 - Data security is a big concern these days and should be given due weightage while evaluating technology and its implementation.

What are some of the new IT and OT initiatives planned to be undertaken?

Arup Ghosh

TPDDL is in the process of rolling out an extensive communication canopy comprising radio and optic fibre. AMI, including smart meters, would operate through this communication canopy. Phase I of this project is likely to conclude by 2017. The other new initiatives of business analytics are expected to mature over the next couple of years, which would bring about further efficiency and improvement.

Praveen Goyal

The focus of IT implementation will be on extending the reach of enterprise application through mobile technologies and on integrating these applications. The implementation of GIS-based appli-

cations, closely integrated with non-spatial applications executed on SAP products will bring in its wake radical restructuring of business processes as well as a high degree of efficiency and data integrity in customer service and asset management processes.

Implementation of SCADA/DMS and OMS applications integrated with GIS data, on the one hand, and IVR, CRM, enterprise asset management and mobile applications on the other, are also expected to bring about a paradigm change in how the distribution network is managed in real time. Implementation of the meter data management application is planned to provide the necessary support for processes such as billing, energy audit, demand forecasting and smart metering applications. It is also envisaged that a head-end application will be implemented that is compatible with both present-day and future-ready technologies.

To cater to the requirements of the in-house portal for task management, information through dashboards, collaboration and knowledge management, deployment of Microsoft SharePoint integrated with Microsoft projects for the enterprise is planned to efficiently man-

age projects and activities taking place within and across functions.

Debashis Roy

A suitable FAN is being planned as a canopy over the licensed area which would back-integrate to the optical fibre network. The FAN would cater to both AMI and DA (like RMU automation, LT automation, street light control, etc).

CESC has decided to upgrade the existing MCC/BCC with an SGCC which would integrate major IT and OT systems. Apart from connecting to all present and future RTUs and FRTUs, the SGCC would also be capable of integrating with the meter data management system for smart meters which are expected to replace almost all the meters in the next few years. It would also integrate with IT systems like GIS (substantial work has already been initiated there), EMS, ADMS suite (power and load flow and volt-var optimisation, despatcher training simulator and outage management system).

The company has over 300 legacy in-house developed software including billing, CIS, mobile app and asset registrar. Most of them would be integrated to the SGCC through an appropriate enterprise service bus.

Realising that all the above would be implemented in a phased manner and since standards and interoperability issues are still evolving, the company has decided to associate with a technology partner from among some of the reputed SCADA/ADMS original equipment manufacturer. A request for proposal was floated and the bids received are being evaluated so that a partner can be identified at the earliest and work can commence soon.

BSES spokesperson

BSES is taking quite a few initiatives to keep IT aligned with business needs and stakeholders' expectations. These include creating an RF canopy for smart grids and smart meters, implementing business analytics, demand response and renovating data centres. ■

