

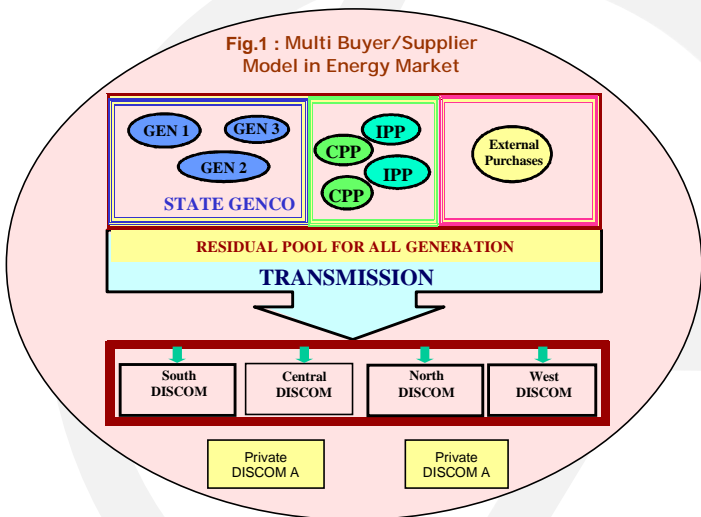
# Interutility Metering And Open Access

... L&T meeting the needs of the India Utilities

## Introduction:

The Electricity Act 2003 has thrown open challenges and is a substantial step in the goal of liberalization, decentralization, reform in the Electricity Sector. As India leaps forward to embrace this openness, it is but natural that there is an urgent need to put in place systems which captures, implement and provides inter/ Intra Utility trading and Billing system with near time information access and availability of information to all involved.

The future of Electric Generation will become a multiplayer/ multilayer model just like a commodity market with spot trading and real-time/ near time control of Energy. Already many Utilities in India have started this exercise and have installed Interface / Boundary Meters with Availability Based Tariff (ABT) features. With such a model, any Generating Company whether it is State Genco, CPP, IPP or National Generation Companies can sell to any distribution company which can be State owned or Private, single in a area or multiple in the same area and the transmission company shall provide the inter-exchange mechanism governed by the rules of the CEA/CERC/State Regulatory Commissions.



## ABT: The Regulatory Mechanism for Open Access:

A major driver / regulation which has put in place the mechanism of Open Access is ABT. The concept of ABT for the Utilities means implementation of systems that will ensure Grid Discipline and will benefit the Power Sector at

large over a period of time. The ABT structure comprises of the following:

- Capacity Charge (As per Plant Availability)
- Energy charge (As per Schedule)
- Unscheduled Interchange (UI) i.e. deviations from schedule Charge (Linked to Frequency) which provides incentives and disincentives for deviations between the scheduled and actual exchange of power, depending on the deviation's contribution to the overall stability and security of the grid.

## Inter/ Intra Utility Metering solution from L&T, Leader in Remote Meter Reading Systems:

L&T AUTOMATION received the prestigious Turnkey project involving Design, Engineering, Supply, Installation and Commissioning of Metering Scheme of RVPN, for Interutility and Inter Company Metering & its operation and Maintenance from Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPNL), the Transmission Company of Rajasthan

RRVPNL has been in the forefront of adopting the latest technologies and gearing up for the challenges thrown open by Open Access under the Electricity Act, 2003. The project is first of its kind in India and involves near time Metering System involving 287 Grid Substations spread over @ 10,000 sq. km of Rajasthan with a mix of communication systems. The System monitors and retrieves data from 400kV & 220kV Grid Substation involving Interface/ Boundary ABT Meters with 0.2S Class Accuracy and 0.2S & 0.5S Class TOD meters at 132kV feeders.



Fig.2 : MAP of Rajasthan

## Architecture:

The system consists of monitoring of 287 Grid Substation with 167 nos. of 0.2S ABT Meters, 718 nos. of 0.2S TOD and 2313 nos. of 0.5S TOD Meters. The integration period for all the meters is 15min, which provides a block wise information of the entire system. The 400/220kV GSS, which are 50 in nos., are connected to the Central Billing Station in RRVPN, Jaipur office directly while the 132/66/33kV stations corresponding to its 220kV stations are connected throughout the 220kV stations to the Central Billing Station. The entire information & monitoring system provides a 15 minute block wise update with near time accuracy so as to enable RRVPNL to perform corrective actions with regards to ABT Tariff Regime and at the end of the month provide Tariff Billing and Energy Accounting/ Energy Losses Report based on the Energy Flow Data.

## L&T Meters meeting the Indian Utility Metering needs:



**Fig.3: L&T ER300P  
ABT Meter**

The meters supplied as part of this package are manufactured by L&T's State of art facility at Metering & Protection System, Mysore. The model no. of the Meter is ER300P, the best and the most commonly used meter in the Indian Electric Utility.

The ABT meters are best of its class and has some advanced features like:

- 0.2S Class meeting IEC 687 and CBIP 88 Standards
- Automatic CT Shorting Feature on removal of meter
- Auxiliary Power Supply 110V/220VDC & 230V AC
- Inbuilt CT/PT Error Compensation software
- Flush mountable
- RS485 Open Modbus Remote Communication port in addition to RS232 Optical Front Port on IEC 1107 protocol

Even the 0.5S & 0.2S TOD meters in addition to standard Utility features have 15minute integration period with RS485 Open Modbus Remote Communication port along with RS232 Optical Front Port.

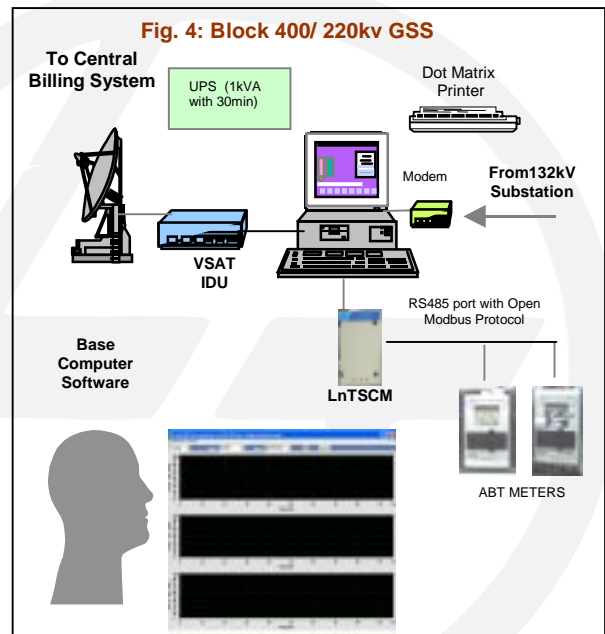
## 400/220kV and 132kv GSS Architecture:

The scope of supply at the 400/220kV GSS and the 132kV GSS are as below:

### a. 400/220 kV GSS:

The 220kV GSS which are around 50 locations throughout Rajasthan is also a block Lead GSS for a group of daughter 132/66/33kV GSS Stations. Hence it forms an important link in the entire chain of information exchange. The following are supplied at each 400/220kV GSS:

- Base Computer Station with 17 inch monitor providing information to the operator
- *LnTEMS™ Vx BCS View*: Base Computer Software which provides the Graphical User Interface to the GSS In-charge and information regarding the Energy flow for that Block GSS.
- *LnTSCM™*: Data concentrator to which all the Meters are connected on RS485 in a daisy chain loop.
- 1kVA UPS with 30minute backup, which provides backup to the PC in case of supply failure.
- ABT & TOD Meter of 0.2S Class with Metering Enclosure
- GPS Receiver (LnTGPS Module) for Time Synchronization of Meters
- Dot Matrix Printer for Station printouts
- VSAT for Communication with Central Billing Station, Jaipur
- PSTN modem for connectivity to daughter 132kV GSS stations



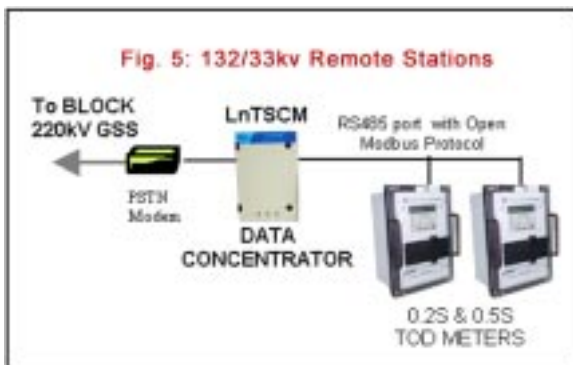
The LnTSCM™ –Data concentrator is one of the revolutionary feature provided as part of the system. It

provides a single point interface for a group of meters. On one side it has the Meters on RS485 while on the other side it is connected on Ethernet 100Mbps to the Base Computer Station. The LnTSCM™ not only provides information very fast to the BCS but also acts as a second level of storage after the meters. In case the communication is broken between the LnTSCM™ and the BCS, the Data concentrator stores the Load Survey data of all the Meters as per the requirement of the Utility to enable download at a future date. As the Data concentrator is collating data of all meters, the BCS does not have to individually poll the meter but just downloads the data from the LnTSCM™ in a single packet which has reduced the bandwidth requirement and the time of download.

**b. 132kVGSS:**

At the 132kV GSS, the supply includes the following:

- LnTSCM™ : Data concentrator to which all the Meters are connected on RS485 in a daisy chain loop.
- TOD Meter of 0.2S & 0.5S Class with Metering Enclosure
- PSTN modem for connectivity to its Block Lead 220kV GSS station

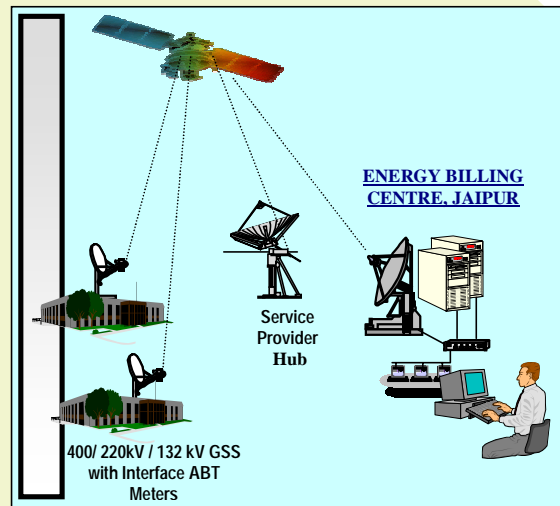


Here again the use of LnTSCM™ - Data concentrator reduces the time of download drastically given that PSTN lines are not so reliable and also the storage feature helps in downloading the data even in case the lines are down for a few days. The system, hence, increases reliability, provides remote management & download of data and substantial saving in charges when compared to a multiplexer kind of system due to shorter download time on PSTN.

**Communication Network:**

One of the major / critical part of the Project is the communication network which is also being provided by L&T as part of the Turnkey Contract. With a stiff update requirement of 2 minutes for information from the ABT Meters throughout the state, there was a need of a reliable communication system with high availability of above 90%

**Fig 6 : RRVPNL Communication Network**

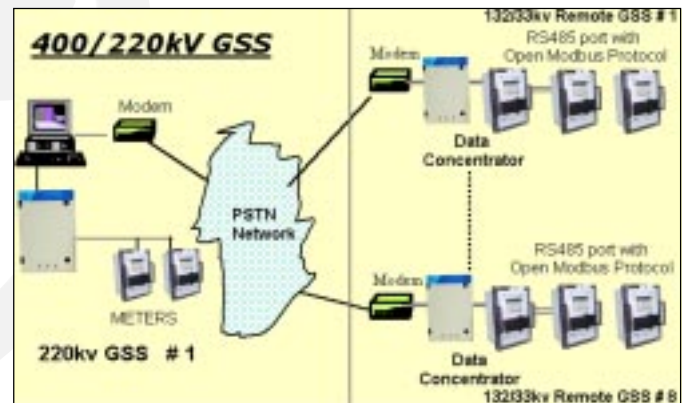


and configurable bandwidth for future increase & compatible to open Ethernet /TCP IP .

A detailed evaluation was made of all the communication system like Microwave, Leased line , VSAT based on the above required parameters and finally VSAT was chosen as it was economical with limited downtime and high availability when seen over a period for 5 years .

The second line of communication network is for capturing data from 132/66/33kV daughter GSS of the respective 220kV GSS. As this information is for energy accounting throughout the transmission system , PSTN lines which were available at the 132/66/33kV GSS Stations were considered adequate. The use of GSM was not considered, as the network availability/ reliability throughout the state in remote interior locations was a problem. The 220kV GSS communicates with its corresponding downward daughter GSS (on an average around 6 GSS per 220kV GSS). The information is accessed every 15 minutes for the previous 15-minute block data of the TOD Meters.

**Fig. 7 : 220kV GSS communication with Daughter 132/33kV GSS**



### Central Billing Station (CBS), Jaipur:

The CBS, at Jaipur, is the nodal/central point for all data throughout the transmission system. The energy information from all Grid Substations (GSS) is monitored at the CBS. The CBS architecture consists:

- Dual Redundant high end Servers on Windows Server technology with Raid 5.
- Oracles 10G based database management system for stable and secure access, operation and report generation.
- 5kVA UPS with 30minute backup for uninterrupted operation.
- Line printer for Report printouts
- 4 nos. of Clients with 17 inch Monitor
- L&T's high end Central Billing Software, LnTEMS™ Bx with 4 nos. of Client Licenses.
- GPS Receiver (LnTGPS Module) for Time Synchronization of CBS
- VSAT connectivity to 220kV Block GSS and other ABT interface boundary GSS.

The CBS will perform the important function of monitoring the entire energy flow of the Transmission System in addition to Billing and Energy Accounting. Also, time synchronization throughout the System is a very important and essential requirement of the system. To take care of this, L&T is providing GPS at CBS and each of the Block GSS that synchronizes the Block GSS equipment & Meters



Fig.8: Central Billing Software at CBS, Jaipur

as well as the daughter 132kV GSS. This gives a very good resolution of the entire transmission energy flow system and improves the overall accuracy of the system. Some of the unique features available at the CBS are:

- Station wise / DISCOM wise Feeder analysis screens in tabular form
- Average Frequency monitoring screen upto last instance of data along with avg. active energy import, avg. active energy export and voltage profile.
- Position of the various GSS in the Rajasthan Power Map with KWh and average Frequency.
- UI Account comparison between NRLDC data and ABT meter data
- Feeder/ Transformer/ Substation availability report
- Energy import through interstate lines, centrally owned and own generating stations (RVUN) report with indicative UI increase and decrease.
- Billing of SLDC charges to DISCOMs, based on Fixed charges and Schedule/Default charges
- Billing of SLDC charges to Open Access Consumers
- Feeder-wise, substation-wise, zone-wise and company-wise billing.
- GSS/ DISCOM wise UI report.

### Benefits of the System:

The system will bring to forefront use of technology for effective and efficient utilization/ implementation of the Energy under open access and provide significant benefits in terms of:

- Improvement in Grid Discipline and Grid Security by having near time information of the Energy flow.
- Improvement in grid voltage levels leading to reduction in transmission losses and enhancement of transmission capacity.
- Enabling a beneficial and online mechanism for meeting Peak Demand.
- Inter/Intra-State trading of electricity will become a reality.
- Real-Time Electricity Market with CPP, IPP, Generator, DISCOM having Open Access.
- Improvement in commercial dealings with greater transparency at all level of generation, transmission and distribution.



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