



Gujarat Power Research & Development Cell

(A Govt. of Gujarat Initiative)

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Meter communication with LoRa

Subject of the Research: Pilot research project to develop communication of existing static meters by implementing a retro-fit kind of cost effective, reliable and Lo-power RF technology called LoRa on the Agri. consumer consumers and there by overcoming the present difficulties of manual meter readings of remotely located scattered consumers.

Present System: Weakest link of any power sector from Energy Generation to Revenue Generation is a meter reading and billing. Error less and timely time billing is still unachieved due to economically unviable technology. As per the present practice, DISCOMs are taking meter readings of al LT consumers by taking manual reading with door to door visit. A meter reader needs to visit meter physically, read the meter and write down the readings and submit the bill to the consumers. Some pilot projects of smart meters have also been done. But, the scalability to the large scale is still a question due to its high cost (Running cost, Installation cost).

Limitations of present system: Conventional manual meter reading system takes much time and manpower. Human error and intentional error cannot be avoided. Consumers of AG feeders are scattered and distributed in the quite wide area. Some cases, installations are not approachable by vehicle even. One cannot ensure that such unapproachable meters readings are correct. In such areas, if meter reading may be made automatic than it can cause saving lots of cost, time, error and efforts. Also, the frequency of getting meter reading is also once in two months for residential, Agriculture consumers and once a month in industrial. Because of this less frequent data collection, this much data is not sufficient to be used for any other purpose then billing such as load pattern analysis, fault analysis, tamper analysis, etc.

Actual real time distribution loss calculation is not possible with the present manual system. As a result wholehearted efforts are not made to reduce the distribution losses as the real loss is not known and result of efforts made to reduce the losses cannot be ascertained.

There are wide variety of communication technology used for smart meters such as PLCC, GPRS, NFC, Bluetooth, RF, Wi-Fi, etc. All these communication have its different pros-cons. Out of these, most widely used smart meters generally work on GPRS by using GSM SIM Cards. Periodic recharge is being done for each and every meter. The new smart meter is installed after removing the existing meter. Thus, purchasing and maintenance cost is very high in replacing the existing meter with a smart meter. But all these comes with vary high cost. Some are having installation cost too high, whereas some are having running cost too high. In the financial crunch that all DISCOMs are facing today, it is very difficult to roll-out the smart metering unless we come up with Cost-effective technological solution, which has low installation cost as well as low running cost.

Detail report of Innovation: Billing and metering is heart of any company as it is only the revenue source of the company. Also timely and errorless billing is very important for consumer service point of view. Remote meter reading is demand of time for timely and errorless metering and billing. Remote meter reading is highly required for energy auditing also.

The remote metering solution using LoRa have the capacity of delivering small amounts of data over long distances (high coverage), and they offer good battery performance too. The power consumption is low so that the operating expenses will not go out of hand. Management and maintenance of the deployed smart meters are straightforward as well.

LPWAN technologies are ideal for creating such meters – and LoRa technology offers several advantages over the other options. For starters, the built-in security of the LoRaWAN protocol (AES-128) is a big factor (neither Sigfox nor cellular standards can match this, while security standards vary in wifi or LAN setups). The open standard nature of LoRa technology and the increasingly strong ecosystem (LoRa Alliance has well over 500 members) also work in its favor. Unlike other technologies that use mesh networks (which typically pulls down battery performance and network capacity levels), LoRa uses a ‘star-of-stars’ topology – to deliver seamless long-range connectivity with battery preservation (the Adaptive Data Rate, or ADR, is crucial for this). In addition, the chirp-based spectrum of LoRa WAN delivers considerably higher communication range than the FSK (frequency shifting keying) modulation used in many other standards. The unlicensed 865-867 MHz ISM band is used in India for designing LoRa-based smart devices so no spectrum licensing required.

The objective of this research is to implement an innovative solution for providing proper, reliable, long life, feasible and less expensive system for meter communication to overcome the disadvantages of existing manual billing system as narrated in the above para 1.4.

Some detailed objectives are mentioned below:

- To run and test the devices on site and check its reliability and working by continuously monitoring it for one year.
- The system should be accurate in terms of collecting, sending and displaying the data in the predetermined time period. The expected accuracy for data accumulation should be >95 %
- The data should be easily visible and accessible on the web portal.
- To get an idea of cost to run this project on large scale for that cost-benefit analysis can be done afterwards compare to existing solutions.
- To get a proof of concept for the system.

To evaluate the performance of this type of communication, it is proposed to conduct the pilot project as under:

- Each node device will be attached to a meter on site. That should be in the range of any single gateway. So, for that, approximately single gateway is considered to cover around 16 meters in range with the assumption that all meters have the large distance in between and aspect the range of Gateway

is 1.5km or more if line of site possible. If there is any possibility, the number of Gateway will be reduced and vice-versa.

- The Gateway will be self-sustaining as it will have a solar panel with battery inbuilt. The height where Gateways will be placed must be greater than 10 meters, if feasible. Gateways and nodes are installed in the supervision of agency to ensure the right way of work.
- Monitoring access to data on the web portal will be provided to DISCOM/GUVNL. Authority can give feedback on the whole system periodically for improvements. For the period of one year, The agency will provide all the support and do the required maintenance of the whole project as per the given feedback.

How does new innovation help to overcome drawbacks of existing system: This type of meter reading will be cost effective and solid technical solution, especially in the areas where the line of sight is clear like AG areas. Only with single GPRS device, we can take readings of many meters in the nearby vicinity of 2 km² area or so. The automation will not only help to make the reading more accurate but also allow to monitor the parameter remotely. This data may be very useful.