

**TECHNICAL SPECIFICATION**

**FOR**

**GPRS MODEM FOR ENERGY METER**

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## 1. INTRODUCTION

The Automatic Meter Reading of meters at consumer premises enables effective surveillance and remote metering of all parameters of energy consumption at the consumer end and is particularly useful for industrial and high value consumers where accuracy of billing and timely payment are important. It is important to monitor consumption patterns for such consumers to detect theft and it is possible to do this remotely with Remote Meter Reading System.

The Remote Metering System consists of a remote unit(s) having tele metering circuit which receives the signals generated by the electronic meters fitted with an external Modem at the consumer's premises. The remote units are connected to the control station through a dedicated communication link which should be Mobile link, i.e. GPRS Modem. Communication system between the meter and the DISCOM control centre through Meter Data Acquisition System (MDAS) the remote metering system makes it easier for the centre to receive data relating to energy consumed as recorded by the meter and send appropriate control signals to the meters and also receive pre-programmed required information from the meter automatically.

## 2. SCOPE OF SUPPLY & WORK:

The scope of this contract includes but not limited to design, engineering, manufacturing, assembling, inspection & testing at manufacturer's works, supply, delivery at site and successful commissioning modems & necessary software with complete Remote Metering System as mentioned hereunder.

- 2.1. Modem shall be compatible with DLMS protocol of all existing HT/ LT/ DTR DLMS meters installed/to be installed electronics meters and which are supplied by various suppliers.
- 2.2. Supply of all such accessories/parts which are useful and necessary for its electrical, electronic and mechanical safe operation deemed to be within the scope of this order, whether specifically mentioned or not.
- 2.3. Scope of this contract includes necessary training (two days) to engineers in charge of DISCOM for handling of Modem software, download of data by establishing remote connection with Consumer Meter Unit (CMU), too aware about all features of software and hardware.
- 2.4. Necessary SIM cards having data transfer facility shall be under scope of DISCOM.

## 3. GENERAL REQUIREMENTS:

Security of Data in transit must be provided by using standard protocols, Error detection and correction protocols & security measures. The system must have adequate redundancy & archival capabilities. The meter data can be retrieved by the Central station specifying the information to be retrieved. The communication links between CMU & DISCOMs various information centres must be fully encrypted as per relevant Data Encryption Standards (DES). The system must have adequate redundancy & archival capabilities.

#### 4. MODEMS:

The Modem shall be used at the consumer/Audit meter terminals for transforming the signal and transmitting through the selected medium. A standard compatible Modem shall be used for communication.

The Modem shall: Have connector interface to Optical Port/RS232/RS485

Work in polling mode

- Have auto polling and data rate selection
- Support serial binary and asynchronous data format for data transfer
- Have a facility of error correction as per Microcom Network Protocol (MNP) or advance compatible.
- Not be susceptible to electromagnetic and other interference from nearby monitors and power supplies
- Have data compression facility as per MNP or CCIT standard
- Have adjustable data rate.
- Be equipped with suitable necessary cable which is compatible to connect modem with meters having Optical communication ports.
- Length of power cable and data cable should be minimum 1 meter.
- Have facility to install in MMB/SMB rigidly within built rubber antenna.

#### 5. SPECIFICATIONS AND SALIENT FEATURES OF MODEM

The offered MODEM shall be an intelligent device connected to an Electronic Energy Meter by means of communication port, installed at various consumer premises (HT/LT consumers) to collect the following data as per configured frequency/On demand.

- I. Complete Meter data stored in the meter.(hourly/daily/weekly/monthly)
  - Instantaneous parameters, at the time of reading
  - Billing data, present and last 12 months histories (as stored by meter)
  - Load survey, 30 days/complete no. of days stored
  - Tamper data, Settings/Configuration data
- II. Instantaneous parameters.(Configurable to provide Every minute data)

#### Key Features:

- a. Compatible with various standard DLMS compliant Meters
- b. Shall have meter detect and meter data read feature which enables communication with all popular Indian DLMS energy meters.
- c. Shall have auto restart feature with built-in watchdog timers and intelligence
- d. Shall have over the air (OTA) program feature which will reduce the manual field visits and also save project time. The modem firmware shall be reprogrammed from the server remotely.
- e. Remote start/stop and restart feature.

- f. Auto recovery feature in case modem / network hanging.
- g. Comprehensive self-diagnosis feature which will create log file with all at a periodicity and link check for communication.
- h. Real time outages, alarms as alerts to server Automatic GPRS connection (no AT commands required) and watchdog for reliable Communication
- i. Inbuilt 3 Phase Power supply as well as operational on single phase automatic pushing of meter data at configured regular intervals with server configurable intervals.
- j. On line monitoring of vital Instantaneous parameters like voltages, currents energies, powers, power factors, etc.
- k. IP (internet protocol) based Communication, enabling simultaneous data access from thousands of GPRS Modems.
- l. Configurability to remotely change server port and address.
- m. Shall use meter supported baud rate to read meter data and shall use maximum network supported baud rates to push the data to server.
- n. Shall have a configuration over the air feature through which all the GPRS Modem operational settings will be configured.
- o. Shall have a configurable scheduled meter read and data transmit feature to enable grouping of the meters so that the loading on the server is equally distributed from all the field installed modems.
- p. Shall have selective on-demand meter read feature through which server can send an on demand request to modem to read the selective parameters from the meter.
- q. Modem must have at-least 16MB of on board user data memory to store data in case of network failure.
- r. Modem must be plug and play and preconfigure it in modem.
- s. Starting from very first installation modem should be able to send instantaneous data to server within 5 minutes (considering average network availability) this will help speedy field installation and confirmation of correct installation of modem.
- t. Modem having hard boot facility like in built power supply ON/OFF switch or detachable power supply cable form modem side.
- u. Shall have on-line tamper detection feature through which GPRS Modem will continuously pool the meter for any new tamper and will send the event to the server and also to a set of pre- programmed mobile numbers as an SMS alert.

### **5.1 Power Supply Section:**

- a. The offered GPRS MODEMs should capable of operating on three phase supply drawn from the meter input itself. Auxiliary power supply will not be acceptable.
- b. The GPRS MODEM shall have three phase AC input supply and should be capable of proper functioning within the power supply range of 77 AC P-P to 470V AC P-P, 50 Hz so that same GPRS MODEM shall be used for DTR meters, HT and LT Tri-vector meters. However the GPRS MODEM should also be capable of operating on single phase 230V, 50 Hz power supply. The GPRS MODEM shall be suitably protected against surges.
- c. Average Power consumption of the GPRS MODEM shall not be more than 3.5 VA under idle and during data transfer.

- d. Withstand capacity against surges should be according to Indian conditions i.e. 6.0 kV.
- e. The power supply input shall be a suitable fourcore integrated cable coming out from AMR box.
- f. The GPRS MODEM shall have capability to work under continuous power on condition.

### **5.2 GPRS Section:**

The GPRS module shall comply with the following:

- a. The module shall operate in quad Band 850/900/1800/1900MHz.
- b. The module shall be compliant with ETSI GSM Phase 2+ Standard.
- c. Class 4 (2W) @ 900 MHz, Class 1 (1W) @ 1800 MHz
- d. The module shall support Point-to-Point (MT/MO) transmission and Cell Broadcast features.
- e. Serial binary and suitable data format for data transfer.
- f. Cell Broadcast
- g. Short messaging service (SMS) features of Text and PDU
- h. Devices shall have the capability of data encryption with v3DES to ensure secured communication network over GPRS (3G/4G), Broadband or latest

### **5.3 SIM Card Section:**

- a. For placing the SIM Card, a SIM Card Holder shall be provided on the motherboard and shall be accessible only by opening/sliding the cover, GPRS MODEM shall not be opened for replacing the SIM card.
- b. The SIM Card supported shall be of 1.8V/3V Interface.
- c. Interlocking facility shall be provided under the device cover.
- d. SIM card slot/cover shall be sealed to avoid access to unauthorized.
- e. The offered GPRS MODEM shall comply for ESD as per IEC61000-4-2.

### **5.6 Communication Interface & Capabilities:**

- a. A RS232 / RS485 Serial Link supporting up to 115,200 bauds with an auto- bauding option shall be provided. However the data transfer rate for remote meter reading shall depend on meter compatibility.
- b. The RS232 / RS485 output shall be provided on a 9-pin female / RJ11 connector which can be connected to electronic energy meter's optical / serial communication port through suitable communication cable.
- c. The GPRS MODEM shall be suitably pre-configured for meter reading & transferring the data to the DC.
- d. GPRS MODEM should be Quad band GPRS MODEM capable of operating at 900 and 1800 MHz GSM transmission.
- e. GPRS MODEM should support both Data and SMS transmission. It should have GPRS features.

**5.7 RF Antenna:**

A SMA interface shall be provided on the GPRS Modem to which either a fixed or a wired (with magnetic base) Dual Band built-in Antenna of minimum -6dbi gain can be connected. Provision shall also be made to connect 14dbi high gain external Yagi antenna to improve poor signal strength.

**5.8 Network Identification Section:**

For determining the health of the device an LED shall be provided on the GPRS MODEM which will depict the current functioning status (power up/ Reading meter/registered in network/transmitting data).

**5.9 Data Features for GSM/GPRS module:**

Internet Services : TCP, UDP, HTTP, FTP  
 GPRS Data transmission features: GPRS Class B Multi slot class 12 or class B Multi slot class 10  
 Packet channel support : PBCCH  
 Coding Schemes : CS1 to CS4 compliant with SMG32 (Release 97)  
 EMI/EMC Specifications : Electrostatic Discharge IEC61000-4-2  
 Fast Transient Burst IEC61000-4-4  
 Surges Immunity IEC61000-4-5  
 Conducted Emission CISPR22 (class B)

**5.10 Mechanical Specifications:**

- a. GPRS MODEM shall be compact, as this device will be placed in a compact meter box.
- b. Mounting Arrangement: Easy mounting arrangement with a hook Provision on the GPRS MODEM supported with the screw fixing arrangement. So that it will be comfortably fixed inside the meter Box.
- c. The GPRS MODEM shall be a compact model housed in a polycarbonate/ engineering plastic enclosure.
- d. The GPRS MODEM shall comply with IP65.

**5.11 Sealing Arrangement:**

The Top and Base Cover shall have a suitable sealing arrangement so that the GPRS MODEM cannot be tampered.

**6. Environmental specifications:**

The GPRS MODEM shall meet the following environmental specifications:

Temperature: -10 degrees to +55 degree  
 Humidity: up to 95% RH (non – condensing)

## 7. Functional specifications:

The GPRS MODEM should be an intelligent device and capable of providing the following functionalities on GPRS network:

- a. The GPRS MODEM should be capable for long duration data transfer to central station as per configuration.
- b. When the GPRS MODEM is busy in collecting the data from the meter and the request comes to get the data, then priority shall be given to request from central station software.
- c. Power Outage Notification: In the event of an outage, the GPRS MODEM should be able to send the outage alert to Data centre with date and time of occurrence/restoration.
- d. The GPRS MODEM should be capable of operating with SIMs of local GPRS/ Service provider in the area.
- e. GPRS MODEM should be capable for continuous working for 24 hours every day under field conditions, even when enclosed in Metering Cubicles at Consumer sites.
- f. Modem shall have facility for Auto-Scheduler to enable automatic/Unattended data collection during night hours.
- g. Modem should support push and pull mode of operation.

## 8. Data transfer in push Mode:


By default GPRS MODEM should be configured for push mode of data transfer i.e. GPRS MODEM shall automatically establish a session with Static IP of EMDA Server at DC at specified time (once in a hour/day/week/month) for the purpose of meter reading through GPRS only. This configuration of the GPRS MODEM shall be configurable remotely. If GPRS MODEM could not establish connection to the Server placed at Data centre at specified time, then it shall retry the same as configured.

## 9. Data transfer in pull Mode:

In case the data is required on demand from the Data centre end (Server end), then connection shall be established from headend to the device. User shall have option to get the meter data available in the memory of intelligent AMR, invoke the Modem to read & upload the meter data. Provision for flexible scheduling of automatic meter reading by modem automatically on a predefined hourly, daily, weekly or monthly basis. Provision shall be made to read the groups of energy meters in one go from the AMR software and the searchable by Meter number, or as a separate group.

## 10. Interfacing with MDM System:

Energy Meter Data Accusation System uses JSON / xml format to exchange data to/from server. Sample code is given below. Successful bidder will be shared complete details of communication with MDM System. Modem must be capable to break long data into multiple packets and send to server.

  
Sample CDF File.zip

Sample JSON: {"Inid": "reading id", "time": "Time of reading in yyyy/mm/dd hh:mm:ss format", "vr": "R Phase voltage in floating point, "cr": "R phase voltage in floating point, ...}

**11. Software requirement for Meter data collection – MDAS**

11.1 The bidder shall be solely responsible for engineering, supplies, with warranty for modems being supplied. In particular the end-to-end responsibility of consistently reading meter data with the supplied modems and commissioning of MDAS solution requirements lies solely with the bidder.

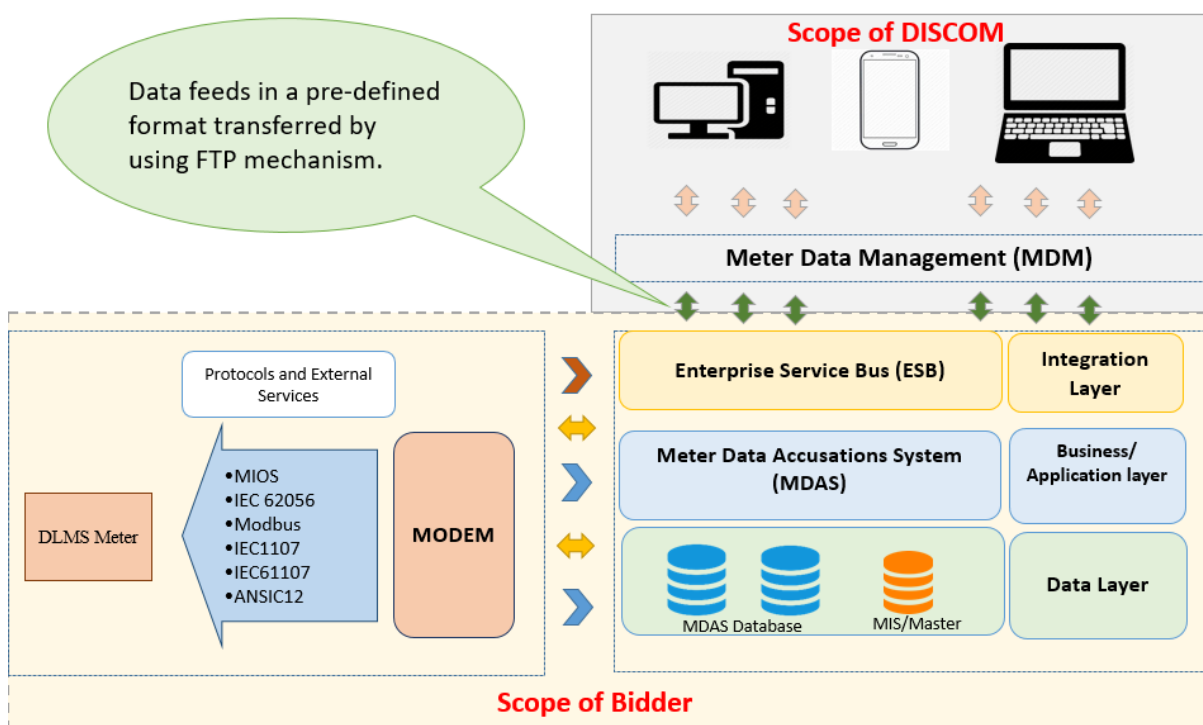
11.2 Complete meter data should be available including instantaneous, billing data, meter and modem events, daily energy snapshots, meter information, etc in the prescribed format. Apart from ensuring meter data availability as per prescribed format, the bidder shall also provision centralized server application for managing modem configuration and scheduling as well as remote modem diagnostics and troubleshooting of field issues.

11.3 The software supplied shall be capable of store and display following parameters

- Storing and displaying meter data according to administrative hierarchy
- Storing and displaying Tamper data recorded in meter and generation of alarms,
- Use of open source platform is desirable.
- Various sample reports from our existing Base computer system

These are indicative reports. System should cover various reports in user friendly manner.

11.4 MDAS Architecture:



**A. Integration Layer**

The integration layer shall consist SOA Service bus also known as the Enterprise Service Bus (ESB). The primary purpose of the service bus shall to facilitate interoperability among different software applications/components of the proposed application as well as external components of DISCOM/GUVNL. Web services that are deployed on the SOA service bus.



**B. Business/Application layer**

The business/application layer shall be a set of components where the business logic for the proposed application is stored. The main application components that make up this layer are as follows:

## a) Meter Data Acquisition System (MDAS)

MDAS will carry out real-time data acquisition from the deployed meters, and organize the data in the database in a Common Data Format (CDF) in the MDAS database. MDAS application mainly consists of following components:

- Communication server application: Communication server application will establish communication with modem and process the data sent by the device.
- Open Platform Communication (OPC) Server application: OPC server will read the raw data which was received by communication server application and convert the raw data to actual meter data that would be stored in the database.

## b) Management information system (MIS).

MIS solution will provide the ability to extract and access information related to meter data from the MIS database for a numbers of measures and generate reports. Reports can be Operational, MIS or Regulatory in nature. This layer would be built using the MIS database application layer that would organize the data in MIS database and display the reports on using web services hosted on the Service bus.

**C. Data Layer**

The data layer shall consist of the databases/scheme as used for storing the data sent by meters and the results of various MIS reports. These databases would be open source relational database compatible with the MDAS software.

**12. Tender Sample:**

Bidders are requested to submit 2 (Two) nos. of tender item samples as per technical specifications and with accessories for down loading the data from meter. The samples are to be submitted to the Deputy Engineer: Regional Store Office: \_\_\_\_\_ GUJARAT VIJ COMPANY LTD.: \_\_\_\_\_ before due date and time of relevant documents physical submission. Samples are to be submitted along with the covering letter mentioning the serial nos. of tender item. Further during the process of opening and evaluation of the box/container of the bidder sample does not contain the required nos. of tender samples, offer for that bidder will not be considered. Please note that samples of tender items are to be submitted strictly as per the tender technic check according to technical specification will be done on tender sample in presence of representative of Bidder.