# Overview

PVVNL is executing meter data acquisition system under RAPDRP for all DTs, HT/LT consumers in Urban & Rural area. Year on year, quantity of metering points are increasing therefore PVVNL intends to purchase additional modems for DTs/ consumer of load more than 25KW for whole discom.

Their main objective is to install data acquisition device (modem) on identified metering points and integrate those modems with existing/upcoming Data acquisition software (DAS) installed at Lucknow central data centre (CDC).

PVVNL don’t want to purchase any additional DAS system for these new modems. Integration of offered modems with RAPDRP DAS system is the prime responsibility of the bidder. Modem should be capable to read all makes of DLMS meters and be able to transfer the data & integrate with existing System Integrator’s (SI) billing system.

# Deployment Architecture

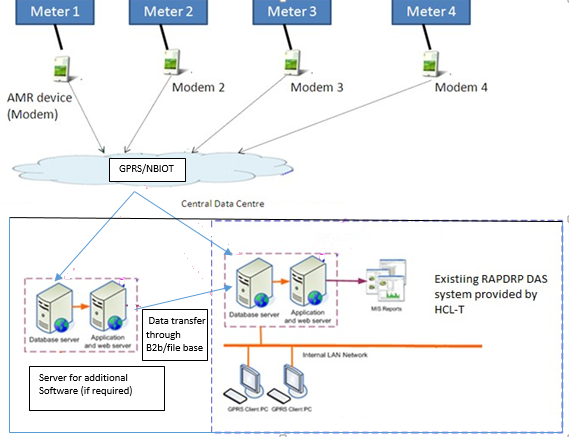


Fig1: Schematic deployment diagram (Typical)

To achieve the overall objective of Meter Data Acquisition, above shown architecture at meters end and Data Center needs to be deployed.

# Meter data collection

* + 1. **Methodology:**

New modems need to deployed at metering points of consumer meters. Utility will provide the GPRS/NBIOT enabled SIM and GPRS/NBIOT connectivity in modems. Vendor need to install the new purchased modems and ensure the meter reading at CDC at MDAS system (either direct or any supporting software) provided by UPPCL as the frequency of Modem shall support the (hourly/daily/monthly) data collection frequencies and following data set shall be available to select for data collection: -

Instantaneous parameters, (Every 15/60 minutes/daily), Billing data, present and last 12 months histories, Load survey, 1/7/30 days based on reading schedule frequency & Tamper data, Settings/Configuration data

Modem should have the capability to integrate with existing/upcoming DAS system installed at CDC Lucknow. It should also follow the functional specification of MDAS solution considering data security and reliability during the data acquisition. Desired configurations in modems should be possible from remote end.

# Communication device (Modem) technical specification

Modem need to be suitable for communication with all type of DLMS electronic energy meter. The modem will be used for remote meter reading of DLMS electronic energy meters via GPRS(4G)/NBIOT infrastructure.

Various required features of intelligent modem (to be installed with electronic energy meter) are described as below:

**Functional specifications:**

1. Modem should have fully compliance all SRS technical specification

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| AMR2.1 | Interface capability with RS232 cable/ Optical Port |
| AMR2.2 | Should be capable of operating on Three phase supply drawn from the Meter input itself. Auxiliary Power supply will not be acceptable. |
| AMR2.3 | The operating voltage range for the modem should be 90 V ac P-P to 440 V ac P- P, so that the modem can be used on both HT & LT Trivector Meters. However the modem should also be capable of operating on single phase 230 V, 50 Hz power supply. |
| AMR2.4 | The Modem should be capable to transfer the entire data of Tri-vector Meter in less than 10 Minutes after connection is made assuming there is no line disturbance. |
| AMR2.5 | The Modem should be supplied with power cable, antenna with co-axial cable of suitable length, RS 232 connecting cable, mounting adopter etc. and should be complete in all respects. |
| AMR2.6 | **Sealing:** The modem should cover and the SIM card holder cover should have arrangement for sealing. Withstand capacity against surges should be according to Indian conditions i.e. 6.0 kV. |
| AMR2.7 | The Modem should have flexible external antenna to enable placement of the antenna at the location of strongest signal inside the Metering Cubicle. |
| AMR2.8 | **Outage Notification:** In the event of an outage, the modem should be able to initiate separate call or send SMS to predefined number to notify the outage event with data and time of occurrence and restoration. |
| AMR2.9 | In the event of an outage, the modem should be able to initiate separate call or send SMS to predefined number to notify the outage event of occurrence and restoration. |
| AMR2.10 | The Modem should act in such a way that the Commands received from Data acquisition server should be conveyed to meter and data from meter should be conveyed to Sub division data acquisition server without any change |
| AMR2.11 | Data collection from meter should take place only after connection is established |

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|  | between Data acquisition server and Meter. Data should not reside in the modem before the time of transmission to Sub division/Electric Supply server, to avoid  chances of tampering of data |
| AMR2.12 | The Modem should be capable of operating with SIMs of local GPRS/NBIOT Service provider in the area. |
| AMR2.13 | Data enabled SIM card will be provided by the utility and monthly SIM charges will be borne by the utility. |
| AMR2.14 | Modem should be capable for continuous working for 24 hours every day under field conditions, even when enclosed in Metering Cubicles at Consumer sites. |
| AMR2.15 | Software shall have facility for Auto-Scheduler to enable automatic / Unattended data collection during night hours. Scheduled meter reading and Automated meter data push to secured FTP server on predefined schedule frequency along with data storage capability |
| AMR2.16 | GPRS/NBIOT Modems and SIM cards Specifications as per the below  requirements: |
| i | GPRS/NBIOT Modem shall be suitable for long duration data transmission and shall be protected from external interference of systems working at different bands. |
| ii | **Mechanical Specifications:-** Modem should be a compact model housed in a polycarbonate / engineering plastic / Metallic enclosure. The modem should  comply with IP55 degree of protection |
| iii | **Environmental Specifications :-** The Modem shall meet the following environmental specifications : -   * Storage Temperature : -20 degrees to +70 degree Celsius * Operating Temperature: -0 degrees to +70 degree Celsius * Humidity:- 95% RH ( Non - Condensing) |
| iv | **Communication Capabilities: -**   * Modem should be Dual Band modem capable of operating at 800, 900 and 1800 MHz GPRS/NBIOT transmission. * Modem should support both Data and SMS transmission. It should have option for mail and SMS notifications to defined system users. |
| v | **Interface :-**   * Modem should have an RS232 Interface through a 9 pin or 15 pin D type Connector for connection to Meter. * The SIM card supported shall be of 1.8 V Interface, which should be fully inserted inside the modem. The holder opening should have a cover with provision for sealing after placing of the SIM card. The modem shall accept the standard/ Nano SIM Card. * Modem should have a SMA Antenna connector |
| vi | **Power :-**   * Maximum Power Output should be 2 W at 900 MHz (Class 4) and 1W at 1800 MHz (Class 1). * VA Burden of the Modem should not exceed 4.5 VA idle conditions |

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| viii | **Data Features: -**   * Max. Baud Rate: for GPRS/NBIOT Operation – 9600 bits/sec |
| ix | **CSD Data transmission features :-**   * Data circuit asynchronous, and non transparent upto 14.4 Kb/s * V.110 * USSD Support |
| x | **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 (Release97) |
| xi | **The Modem shall comply with the following GPRS/NB-IOT Specification:**  **•** Frequency band : 900/ 1800  • Class : Multislot Class 10 /12  • Mobile Station Class B  • Packet channel : Full PBCCH support  • Coding Scheme : CS 1 – CS4  • Output power : Class 4 (+33dBm ±2dB) for GSM900 Class 1 (+30dBm ±2dB) for GSM1800  • IPV4 and IPV6 Support  **•** NB Frequency band: Band 3 (1800 MHz) and 5 (850 MHz)  • Standard: 3GPP release 13 or above  • Output power: Class 5 (+20dBm ±2dB) for all supported LTE |
| xii | **SMS Features: -**   * Text and PDU * Point to point (MT/MO) * Cell broadcast |
| xiii | **Operational Indicator :-** The Modem should have separate LED indications for transmit data, received data, carrier detects and Power ON, etc. to indicate Power on position and to indicate the availability of signal at the place of installation |
| xiv | IS/IEC Specifications:  The modem shall meet the following IS/IEC specifications:   |  |  |  | | --- | --- | --- | | 1 | Impulse voltage test | IEC61000-4-5 | | 2 | AC voltage test | IS13779:1999 | | 3 | Insulation resistance test | IS13779:1999 | | 3 | Electrostatic Discharge (ESD) | IEC61000-4-2 | | 4 | Electromagnetic radiated HF susceptibility | IEC61000-4-3 | | 5 | Fast transient Burst test | IEC61000-4-4 | | 7 | Surge Immunity test | IEC61000-4-5 | | 8 | Safety compliance | IS 13252 | | 9 | Conducted Emission | CISPR22 (Class B) | |

1. Modem should have capability to read meters in schedule mode as per the desired frequency i.e. (hourly/daily/monthly) as well as in on-demand mode.
2. Sealing Arrangement: The Top and Base cover shall have a suitable sealing/break to open (welding) arrangement so that the MODEM cannot be tampered
3. Modem should work in both dynamic IP and static IP condition. Modem shall have capability to auto detect meter, collect the reading data and transfer data to backend using suitable cellular technology.
4. Modem should always be reachable from the data centre, even if gets de-registered from the network or gets hang, it should automatically get registered again. The modem shall have minimum memory of 4 M.
5. The modem should have randomization logic to send data, which will ensure all the modems are not sending data at the same time to the Data Centre considering same reading frequency.
6. Modem vendor should ensure data integrity & data security of the file during data transmission. Encryption & decryption techniques shall be used for data transfer for data security purposes.
7. Scheduling meter data reading feature need to be available in modem & it should be configurable from data centre. The modem should be able to accept configuration setting data through SMS also.
8. Modem should be meter manufacturer in-dependent should be capable to read all open protocol meters. Modem shall be auto configurable by itself to the different makes of meters i.e. plug & play.
9. Modem needs to ensure the data flow to the backend application in transparent mode for further processing at application end like data conversion because all APIs resides at DAS application end only.
10. Meter time synchronization facility should also be a part of modem specification.
11. Modem should have capability to log system health parameters like signal strength etc. For easy diagnostics.
12. Modem vendor need to execute a POC with existing DAS system of HCT-T.
13. Modem vendor should also be responsible to provide the diagnostic data so that non-read meters can be analysed further to segregate the field issues.
14. **Auto Registration Feature:** Modem should have an additional feature that whenever it will connected to the meter and get power up, it will automatically connect to the DAS software at data centre and registered itself. Installer can validate the registration of modem at GPRS network by blinking rate of LEDs provided in modem.
15. **Outage Notification**: Modem should have the capability to send the SMS to pre-defined nos. through emergency power supply as soon as power is gone and similar message is sent on recovery of power in meter.
16. **Download over the Air-Firmware upgrade:** Modem should have the capability to upgrade the firmware version through communication network, this facility knows as DOTA/POTA.
17. Modem shall comply IT security norms and provision of transport layer security (TLS) compliance.

# Integration with existing DAS solution

* 1. **Interface with existing modules:** PVVNL already has data acquisition software DAS under RAPDRP scheme for all DT/HT/LT consumers so the offered modems should have the capability to interface/ integrate (B2B/file base) either directly OR through another software (to be installed by bidder at Data center Lucknow & server space to be provided by UPPCL/ PVVNL) with the existing DAS application.

New modems will be read via existing/upcoming system & POC execution will be the responsibility of the modem vendor only. **After Successful completion of POC with various makes of DLMS meters installed in PVVNL Discom, the Price Bid (Part-II) of only the successful bidders will be considered for opening whose modems clear the POC as per specification.**