

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)**1. SMART METER WORK****1.1 DESIGN BASIS REPORT**

1.1.1 The intent of this document covers the design basis for various items covered in the scope of work.

1.1.2 This design criteria is aimed at consolidating the basis of the work that the Contractor's designer is going to carry out in delivering the framework for smart meter system which will satisfy the functional needs, adhering to standard specification, installation standards, industry standards, Indian Standards Code provision and Codes of Practice specified or referred in the tender.

1.1.3 This design basis report covers the minimum design requirement to establish safe, durable & functional design basis that will form the overall design philosophy to be adopted in the Smart meter system design of this project. Not mentioning of any relevant criteria/design requirement in this design basis report will not free the contractor of the liability to follow the same. The contractor shall ensure adherence to the latest available codes to be followed at the time of design.

1.2. The scope of work generally shall be as given below:-

- (a) Supply install testing AMI system including smart meters of different makes, communication modules having GPRS(3G/4G/5G)/RF (MESH network) or Canopy/ Hybrid(RF+GPRS 3G/4G/5G)/ any other advanced technology, meter box and other associated accessories for consumer metering.
- (b) Deploy Meter of Data Web Based Application on server or Govt community cloud for meter data Acquisition, Meter Data, Analysis, Meter data management report generation, integration with MES billing & other IT systems and dissemination of information on Web Portal/Web Application and Mobile App (Android & IOS)
- (c) Perform site survey and deciding the communication technology to ensure data availability of all the consumers.
- (d) Supply the required 5G/4G/3G/GPRS SIM along with the appropriate data packs for the contract duration.
- (e) Deploy required manpower for repair, maintenance, replacement, updating, change management of the system covering metering infrastructure. IT infrastructure, hosting & software solution.
- (f) Deposit the replaced meters and accessories in MES stores aligned with defined process.
- (g) Integration of different devices of different makes/equipment's/software as per functional requirements including water charges/furniture charges / license fee and other allied charges. Bank details of GE and payment gateway would be integrated with the software and also calculation of refund on vacation of qtr.

1.3. Basic Functions of Smart Metering System

The main objective of AMI is to establish two-way communications between smart energy meter and Head End System (HES) and enable remote reading, monitoring & control of energy meters and electrical network meters to serve as repository of record for all raw validated and edited data. The AMI helps MES utility to manage their resource and business process effectively and efficiently. The basic functionalities of the Smart Metering System defined by CEA are as below:-

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

- (a) Remote Meter data reading at configurable intervals (push/pull).
- (b) Time of day (TOD)/TOU metering.
- (c) Pre-paid/Post-paid functionality.
- (d) Net Metering/Billing
- (e) Alarm/Event detection, notification and reporting
- (f) Remote Load Limiter and connection/disconnection at defined/ on demand conditions
- (g) Remote firmware upgrade
- (h) Integration with billing & collection software, mapping consumer indexing, connections & disconnection, analysis software outage management system etc.
- (j) Security features to prevent unauthorized access to the AMI including smart meter & meter data etc and to ensure authentication of all AMI elements by CERT auditors of Armed forces.

1.4. In addition to above following Modular functionalities are also required -

- (a) Field replaceable modular Communication Module (shall be bundled in meter housing).
- (b) Pairing with Communication Module
- (c) Geo Location identification.
- (d) Time Synchronisation

1.5. COMPONENTS OF SMART METERING SYSTEM

1.5.1 Smart Meters. Electronic energy meters, capable of two-way communications and two-way measurement i.e. with the ability to measure the incoming and outgoing (Import and export energy) flow of electricity from a specific location such as a consumers home or business as per BIS 16444.

1.5.2 . Communication Network. It consists of two parts-the Local Area Network (localized to meters in the field) and the Wide Area Network (LAN to centralisation-this communication infrastructure enables two-way transmission of data between smart meters and MES utility. There are several different ways this field- based communications infrastructure can be implemented, depending on the metering system selected.

1.5.3. Meter Data Acquisition System/ Head End System (HES) and Network Management System (NMS). The main objective of HES is to acquire data from different end points and monitor them automatically and remotely. The HES should be suitable to support the collection and storage of 15- minute interval data from end points.

1.5.3.1 The NMS is responsible for the establishment and management of all networks, the discovery of all nodes once deployed in the field, the overall system management as well as security management of devices.

1.5.4 Meter Data Management System. A open software application compatible with different makes of smart meters that stores, validates, edits and analyses meter reading data prior to releasing it for integration into other operational systems of utility such as customer billing, load forecasting and outage management.

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

1.6. Interfaces and Integration. This systems integration activity involves providing applications to handle the automated meter reading information of different makes and building interfaces between applications to support MES utility's end-to-end processes. Smart meters of different makes as per BIS 16444 will enable consumers to take advantage of new tools to save energy and money. This includes Mobile Application and web application used by consumer for monitoring usage. The AMI system should support with strong user management, administrative area management and flexible tabular, graphical reporting module.

1.7 Scope of Work. The scope of work generally shall be as given below:-

- (a) Supply, install, testing, commission AMI system including Smart Meters of different makes, Communication Modules having GPRS/ RF or Canopy/ Hybrid(RF+GPRS)/ any other advanced technology, Meter Box and other associated accessories for consumer metering.
- (b) Deploy of Web Based Application on Server or the Government Community Cloud for Meter Data Acquisition, Meter Data Analysis, Meter Data Management, Report generation, integration with MES billing & other IT systems and dissemination of information on Web Portal/Web Application and Mobile App.
- (c) Perform site survey and deciding the communication technology to ensure data availability of all the consumers.
- (d) Supply the required 5G/4G/3G/2G/GPRS SIMS along with the appropriate data packs for the contract duration.
- (e) Deploy required manpower for repair, maintenance, replacement, updating, change management of the system covering metering infrastructure, IT infrastructure, hosting & software solution.
- (e) Deposit the replaced meters and accessories in MES stores aligned with defined process.

1.8 Open and Industry Standards for Inter- Operability.

The proposed solution must have highest degree of inter-operability and the solution components shall be standard based and adopt an open approach rather than support a specific technology.

1.9 Service Oriented Architecture (SOA). AMI solution components of different makes (Make neutral) must follow SOA principles to provide specific make neutral services using well defined interfaces. The AMI solution design shall be based on cross-functional components or subsystems and shall be implemented in such a way that there is an opportunity for reuse. The integration architecture shall be based on the concept of a service, so all the applications of the AMI solution are able to integrate without any complexity. AMI system is envisaged as a service driven architecture at the core of it. AMI system features can be accessed via any user interface (internal or 3rd party applications) which shall work on top of these services. **Adoption of open standards is of paramount importance for the robust and scalable AMI system.** Data access must be always through services, no application will access AMI data directly from the storage layer or data access layer. For every internal data access also (access between various modules) there will be services and no direct access will be there to ensure the AMI system is scalable and secure.

1.10 Solution Integration - The integration middleware should be based on service oriented Architecture (SOA) and other forms of application program interface (API) and use publish subscribe mechanism. The integration middleware to be an open architecture based. Implementation and configuration of functional APIs from different meter manufacturers and configuration of Head End System /Meter Data Acquisition system.

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

All meter data of 30/15 minutes block (Load profile) shall be polled at least once in a day. The duration to polling frequency shall be remotely configurable and can be altered as per the requirement of MES. The bidder must store and manage the security information related to Smart Meters. These include Device Security keys and asset information for processing further by MES. The bidder must support the mass receipt of data of each meters every day and subsequent update of Meter Data Management System with the necessary asset information to complete meter reading and billing. The integration middleware/interface must validate the data to be integrated. It must maintain integration logs that confirm the success or otherwise of the interface, complete with control totals. The integration mechanism adopted must have minimal impact on the existing systems.

- 1.11 Modular Design:-** The application user interface, logic, data must be separate. The logical design of components, sub-systems, application systems and databases will be ideally partitioned. These partitions shall have well-defined interfaces established. Logical boundaries are needed to separate components from each other. Modular design is more adaptive to changes in internal logic, platforms, and structures. It is easier to support, is more scalable and supports inter-operability.
- 1.12 High Availability, Failover and Load Balancing:-** Proposed architecture shall have adequate redundancies to have no single point of failure for the solution. The solution tier for critical applications should consist minimum of two nodes clustered on a fail-over configuration forth critical component like Web application, and database servers/Government Community Cloud at the Data centre site. On failure of the primary application server, the standby server shall take over processing, similarly on failure of a database server, the other server shall continue seamlessly, thus providing the desired availability. AMI applications shall have the capability to failover to a redundant or secondary unit upon failure of the primary unit. Likewise, the load on the primary unit shall be shared with a secondary unit upon the primary unit reaching its capacity
- 1.13 Security Zones Deployment:** -The IT Infrastructure will have multiple security layers to secure the infrastructure from threats. The proposed deployment has different security zones as briefed below and all zones shall have separate firewall in addition to the external (Perimeter security appliances). The firewall policies shall be configured based on zone-based requirements. All user traffic will to enter in this security zone after firewall only. The proposed solution will have provision of dedicated Internal firewall to secure the critical production (Data base and application) environment.
- 1.14 Web server/Application :-** This security zone will host all servers that can be accessed from external users after authentication and traffic filtering This zone shall host the web servers, access control and sign on servers, antivirus server etc.
- 1.15 Testing and Development Zone-**This zone will host all servers required for test and development for applications. This zone will have limited access and it will not have any direct access to Production Servers Zone and the activity shall be monitored. It is to implement Smart Meter/AMI system on GPRS/ RF/Hybrid (RF+GPRS)/ any other advanced communication technology i.e. communication technology need to be decided based on field condition, and most suitable communication technology in that area shall be selected for meter data acquisition.
- 1.16 CYBER SECURITY:** CERT Audit of Smart Metering System at the time of commissioning shall be carried out. Subsequent audit of the system shall be carried out after every three years. Cost of such audits and rectifications thereof shall be borne by the contractor. This clause shall be applicable to both new as well as existing Smart Metering System. The following cyber security as aspect shall be adhered to:-

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

- (a) Compliance to Information Security Management Standard such as ISO 27001.
- (b) Securing network architecture of the system including hardening and secure configuration.
- (c) Physical security of Smart Metering System.
- (d) Identify and authentication management, access control, Incident detection and response.
- (e) ICT components of the Smart Metering System should have logging feature for monitoring of the parameters Logs must be maintained for a period of six months as per CERT- In guidelines and the same should be integrated with a central sys log server/SIEM.
- (f) Use of Wi-Fi Bluetooth are prohibited.
- (g) Hardening including firmware updation, turning off all unwanted services, ports and features in the IT Assets of the system. This should be carried out during installation and checked while undertaking Internal/External Audits.
- (h) Admin accounts should always be managed by network admin using dedicated/pre designated machines only.
- (j) Custodians of Smart Metering System will be Garrison Engineer.
- (k) Provision of SIEM at the centralized console to analyse logs of ICT Assets.

1.17. MAINTENANCE OF AMI

1.17.1 The contractor shall provide the following services to keep the smart meter system in good working condition.

- (a) The scope of work covers comprehensive on-site operation & maintenance of AMI system as mentioned below for 2 years during defect liability period (DLP) and 8 years post DLP.
- (b) The replacement of all the spares is included under the comprehensive maintenance. Replacement of defective parts will be at the contractor's cost with original spares of the brand/make of respective system. In the event of non-availability of the spare parts, equivalent or higher configuration components should be substituted with the owner's/OEMs consent. Faulty parts removed from the system belong to contractor. However the owner can retain the same and use at its own sole discretion to maintain the equipment subject to the payment of its value to the contractor.
- (c) The contractor shall maintain adequate spare meters and other spares at the site to facilitate any temporary replacement.
- (d) The contractor should ensure that the equipment reported down on any working day is set right within 24 hours of reporting the complaint In case, the equipment cannot be repaired within the stipulated period, the contractor should provide stand-by of the same till the hardware is returned duly repaired at no extra cost to owner. **Further if the same is not rectified within 24 hours , a penalty @ Rs 250/- per day will be imposed till the rectification of same.**
- (e) The Contractor shall maintain the equipment's as per the manufacture's guidelines and shall use standard and genuine components for replacements.
- (f) The timely updating of equipment serial numbers, inventory list duly updated with details of new installation, if any and incorporating the equipment movement during the period under reference will be responsibility of the contractor Maintaining log books for various equipment and submit to GE on monthly basis.

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

- (g) **Complaint can be registered either telephonically or by e-mail and proper record of the complaints to be maintained by the Contractor.**
- (h) A logbook shall be maintained in which the contractor shall record all the complaints made and parts taken out of campus for repair. The contractor shall submit copy of consolidated complaint reports furnishing the details of system-wise breakdown calls lodged/attended and its status on monthly basis to department.
- (i) All the complaints received shall be attended by them in following manner
 - Minor faults immediately with telephonic support.
 - Major faults which require visit to branch within 24 hrs.
- (j) Repair and servicing of equipment shall be carried out at customer sites, in case the equipment is required to be transported to the contractor's/manufacture's service workshop for repairs, the same shall be undertaken at the risk and cost of the contractor
- (k) The replacement of components shall be as per manufactures instructions and as per the decision of department. No equipment items or parts will be taken out for repair without prior written approval of Engineer in charge.
- (l) The contract shall be on comprehensive basis, inclusive of repairs and replacement of spare without any extra payments.
- (m) It shall be the responsibility of the Contractor to make all the systems and equipment's work satisfactorily throughout the contract period and to hand over the systems in working condition to department after expiry of the contract In case any damage is found, the AMC Contractor is liable to rectify in even after the contract.
- (n) Department may decide to add or remove certain equipment's or peripherals from the at any point of time during the contract Payment for any inclusion / deletion of equipment parts and other peripherals during the comprehensive maintenance period will be calculated on pro rata basis
- (o) If the systems covered under this agreement are not attended for repair or problems are not rectified within the time frame mentioned in comprehensive maintenance Agreement, such defective equipment's/components would be repaired by some third party and the amount spent for such repairs would be billed to the contractor and the same shall be in addition to the penalty imposed **@ Rs 250/- per day till rectification of defects.**

2 EXTERNAL ELECTRIFICATION WORKS

2.1 SAMPLE AND MATERIALS

- 2.1.1 All materials fittings appliances etc. to be incorporated in this work shall be of highest standard and unless otherwise specified here in after shall strictly comply with the relevant IS and BSS for which no IS has been issued. The contractor will supply the samples of the items/materials to GE for approval.

- 2.2 **SCOPE OF WORK:** The work of external electrification comprises of execution of entire completion of works included in Schedule 'A' and all as described in particular specifications and here under.

- 2.3 **PRODUCTION OF TEST CERTIFICATE:** Manufacturer's test certificate in respect of cables and other materials, items or equipments as directed by GE are to be submitted to the GE by the contractor.

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

- 2.4 **EXCAVATION AND EARTH WORK:** The contractor shall excavate to the specified depths as indicated on the drawings and as directed by the Engineer-in-Charge. Excavation made to depths more than the required levels shall be made good by the contractor at his own expense with approved earth by ramming, watering, in 250 mm thick layers. No extra payment shall be made for extra depth excavated and filled by the contractor. The cost of any shoring/ boarding and de-watering shall be deemed to be included in the cost of excavation and no extra payment shall be made.
- 2.5 **FILLING OF PITS AND DISPOSAL:** After laying of the foundation and erection of poles & stay, the pit shall be filled with the spoil obtained from excavation, watered, rammed and consolidated and brought to the level of the surrounding ground level as directed by the Engineer-in-Charge. All surplus spoil obtained from excavation shall be removed to place at a distance as specified, spread and levelled in the manner as directed by the Engineer-in-Charge.
- 2.6 **‘D’ CLAMPS, STEEL CROSS ARMS AND BRACING:** - Refer clauses 19.9 and 19.53 of MES Schedule Part-I. ‘D’ clamps; MS cross arms, bracing and MS brackets shall be of steel section shown on drawings. Where size of any section of steel is not indicated, this shall be as directed the Engineer-in-Charge. These shall be painted with one coat of aluminium paint over a coat of red oxide primer after fixing in position.
- 2.7 **GI PIPES AND FITTINGS** :- GI pipes and fittings shall be laid in trenches, fixed to walls/floor/ceiling/poles and jointed all as specified in clause 18.50 and 18.50.3 and 18.51.1 to 18.51.5 of MES Schedule Part-I.
- 2.8 **CABLES**
- 2.8.1 LT cables shall be XLPE PVC insulated, screened, bedded, galvanized strip or wire& shall conform to IS-7098, Part-I. HT cable shall be as per relevant item of Schedule ‘A’ conforming to IS-7098: Part-II. Laying generally shall conforming to clause 19.75 of MES Schedule Part-I. However, cable protection cover shall be as per relevant item of Schedule ‘A’. Sand cushioning in trenches shall extend 8cm beyond outer edge of cable on both sides. Cables shall not be laid in ashes and organic refuses or any other materials, which may injure the cable. Cables shall be brought in standard drum length. No straight through joints shall be permitted except where length of the cable is more than the standard drum length or where considered inescapable.
- 2.8.2 The portion of cables running under roads, poles or on walls through nallah shall pass through galvanized pipe all as described in Schedule ‘A’ and as directed by the Engineer-in-Charge.
- 2.8.3 The seal of cables shall not be removed until preparations for jointing are complete.
- 2.8.4 Trenches for cables shall be as per clause 19.74 and 19.74.1 of MES Schedule Part-I. Trenches will be filled in after the cable has been tested by the Engineer-in-Charge satisfactorily IR test for all underground cables shall be conducted during and after physical completion. The tests should be recorded and signed by the contractor and Engineer-in-Charge and kept on record.
- 2.9 **EXPULSION FUSES, LINE CONNECTORS, POWER CABLE:-** Refer clause 19.16,19.17 and 19.19 of MES Sch Part I, 2009.
- 2.10 **DISTRIBUTION BOXES** :- Refer clause 19.21 of MES SSR-2009, Part I.
- 2.11 **CABLE TERMINATION & JOINT BOXES:** - Refer clause 19.22 of MES SSR-2009, Part I.
- 2.12 **LOW VOLTAGE SWITCHING AND DISTRIBUTION PANEL:** - Refer clause 19.23 of MES SSR-2009, Part I.

Signature of Contractor

AAD (CONTRACTS)
For Accepting Officer

PARTICULAR SPECIFICATIONS SECTION-II(PSS-II)

MAKES OF PRODUCTS TO BE INCORPORATED IN WORK

S.No	Description	Makes
	E&M ITEMS	
1	LT POWER & CONTROL CABLES 1100 VOLTS, XLPE	RR KABEL, DYNAMIC CABLES, GEMSCAB, KEI, POLYCAB, HAVELLS, GLOSTER, HPL, CABLE CORPORATION OF INDIA, UNIVERSAL CABLE, PARAGON, BCH, L & T, NICCO, FINOLEX
2	PVC WIRES & CABLES 650/1100 VOLTS	KEI, POLYCAB, STANDARD, HAVELLS, GLOSTER, HPL, FINOLEX, NICCO, FINOLEX , L & T, RR KABEL LTD
3.	SMART/TAMPER PROOF ENERGY METERS (DIGITAL TYPE)	ELMEASURE, HPL, L&T, SECURE , BENLO
4	RIGID PVC CONDUIT PIPES	PRECISION, KALINGA, PLAZA, AKG, TIRUPATI, FINOLEX, SUPREME, ASTRAL, PRESTOPLAST
5	GI/MS CONDUIT/ERW CONDUIT PIPE	AKG, BEC, BHARAT STEEL TUBES, TATA , JINDAL , KALINGA, PRAKASH SURYA, TIRUPATI
6.	POLY CARBONATE METER BOXES	HANSEL, SCHNEIDER, SINTEX, SIEMENS, ABB LEGRAND

Note :-

- (i) Makes specified in Sch ‘A’/BOQ shall only be provided when makes are mentioned in Sch ‘A’/BOQ
- (ii) Makes specified in Particular Specifications shall be provided only when no makes are specified in the Sch ‘A’.
- (iii) Makes specified in the Appx ‘B’ shall be provided only when no makes are mentioned in the Sch ‘A’ and Particular Specifications
- (IV) If make for any product not listed in appendix ‘B’ any one of the make as approved/validity renewed by E-in-Cs branch or CE Command till the date of submission of tender, can be procured by contractor. However, criteria of equivalency including category/group of make etc are to be strictly adhered. In case the make deleted by E-in-C/CE Comd after the date of submission of bid any during currency of contract shall be deleted from CA, if any make approved by E-in-C’s Branch/ CE Command after end date of submission of tender is felt necessary to be approved due to site requirement, non-availability of items with firms/makes listed in tender, then it shall be approved subject to price adjustment only with permission of AO supported with complete technical as well as financial data for pricing etc and it shall be ensured that no plus financial effect shall be permitted.

Signature of Contractor

AAD (CONTRACTS)
For Accepting officer