

# **DEENDAYAL PORT AUTHORITY**

**An ISO 9001 : 2008 & ISO 14001 : 2004 Certified Port**



Office of Chief Mechanical Engineer,  
First Floor, Annex Building, A.O.  
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Email: cme@deendayalport.gov.in

No.: EL/AC/2188/EOI

Date: 04.04.2026

## **Budgetary Enquiry**

**Sub. :** Budgetary Offer for "Design, Supply, Installation, Testing & Commissioning of Smart Metering System with Advanced Metering Infrastructure (AMI) including Comprehensive AMC at Deendayal Port Authority (DPA)"

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### **1. Introduction**

Deendayal Port Authority (DPA) intends to upgrade its existing electrical metering system to a **Smart Metering System integrated with Advanced Metering Infrastructure (AMI)** to enable automated meter reading, real-time monitoring, improved billing accuracy, and enhanced energy management.

The proposed system shall support:

- Two-way communication
- Remote operations (connect/disconnect, load limiting)
- Prepaid and postpaid functionality
- Tamper detection and event logging
- Centralized monitoring and analytics

### **2. Purpose of Budgetary Enquiry (Important Disclaimer)**

This budgetary enquiry is issued solely for the purpose of obtaining indicative cost estimates for planning and budgeting. This document shall NOT be treated as a Tender or Request for Proposal (RFP). Submission of budgetary offers does not confer any right for award of work. Deendayal Port Authority (DPA) reserves the right to initiate a separate tendering process in future. No contractual obligation shall arise from this enquiry.

### **3. Scope of Work (Brief)**

The work is proposed on a **turnkey basis** and broadly includes:

- Field survey and consumer mapping
- Design and engineering of AMI system
- Supply of smart meters (LT & HT) and accessories
- Communication infrastructure (NB-IoT/GPRS)
- Installation, testing and commissioning

- Integration with existing billing system
- Supply of HES, MDM, and application software
- IT infrastructure (cloud/on-premise)
- Comprehensive Operation & Maintenance (AMC)

#### 4. Estimated Quantities (Summary)

Sr. No.	Description	Qty
1	LT Single Phase Smart Meters	800 Nos
2	LT Three Phase Smart Meters	500 Nos
3	LT CT-operated Metering Systems	300 Nos
4	HT Metering Systems	100 Nos
5	Meter Boxes	1300 Nos
6	Communication Modules	1700 Nos
7	AMI System (HES + MDM + Software)	1 Lot
8	Installation & Commissioning	1700 Nos
9	AMC (Post Year 1)	9 Years

*(Detailed specifications enclosed separately)*

#### 5. Technical Standards

All equipment shall conform to relevant Indian Standards, including but not limited to:

- IS 16444 (Smart Meters)
- IS 15959 (Data Exchange)
- IS 13779 (Energy Meters)
- IS 15884 (Prepayment Meters)

System design shall also consider applicable guidelines of the Central Electricity Authority.

#### 6. AMC Requirement

- Total AMC Period: **10 years**
  - Year 1: Included in project cost (warranty period)
  - Year 2-10: To be quoted separately

AMC shall cover:

- Maintenance of meters, communication system, and software
- Troubleshooting and repairs
- Software updates and support

**7. Submission of Budgetary Offer**

Interested firms are requested to submit their **budgetary quotation** with:

- Budgetary price (indicative)
- Break-up (if available)
- Assumptions, if any

**8. Submission Deadline:**

**On or before: 15.04.2026**

**9. Mode of Submission:**

Email: [cme@deendayalport.gov.in](mailto:cme@deendayalport.gov.in) / [deepak.hazra@deendayalport.gov.in](mailto:deepak.hazra@deendayalport.gov.in)

Hard copy: Office of Chief Mechanical Engineer, DPA

**10. General Notes**

- Prices shall be reasonable and competitive inclusive all taxes, duties and incidentals, excluding GST.
- GST applicability shall be clearly mentioned
- Any assumptions/conditions shall be clearly stated
- DPA may seek clarifications, if required

**11. Contact for Clarification**

Office of Chief Mechanical Engineer

Deendayal Port Authority

Email: [cme@deendayalport.gov.in](mailto:cme@deendayalport.gov.in) / [deepak.hazra@deendayalport.gov.in](mailto:deepak.hazra@deendayalport.gov.in)

**Enclosures:**

- Price Format (Annexure-I)
- Detailed Scope of Work (Annexure-II)
- Technical Specifications (Annexure-III)

**-Sd/-**  
Executive Engineer  
Deendayal Port Authority

**Annexure I**

**Schedule B ( Price Format)**

Sr. No.	Description	Unit	Qty	Amount	Total
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1	Supply of LT Single Phase Smart Energy Meter (5–60A, 240V, Class 1.0) conforming to IS standards with prepaid/postpaid functionality, NB-IoT/GPRS communication, BLE support, remote connect/disconnect, load limiting, tamper detection, event logging, load survey, complete with all required accessories and suitable for installation at various site conditions	No	800		
2	Supply of LT Three Phase Smart Energy Meter (3P4W, 415V, Class 1.0) with prepaid/postpaid, maximum demand, load profiling, tamper detection, remote operation, communication capability and complete accessories for installation under site conditions	No	500		
3	Supply of LT CT-operated Smart Metering System as complete combined unit including meter, matched CTs, enclosure/panel, wiring, terminals, mounting arrangement and all accessories required for proper installation and operation, suitable for higher load LT consumers and AMI integration	No	300		
4	Supply of HT Metering System including trivector meter, CTs/PTs, metering panel, wiring, terminals, sealing arrangement and all associated components required for complete installation, operation and AMI integration, in compliance with applicable standards	No	100		
5	Supply of LT Meter Boxes (IP65, tamper-proof, suitable for outdoor/indoor installation) as per site requirement	No	1300		
6	Supply of LT CT Metering Panels with complete arrangement for meter, CT termination, wiring and sealing	No	300		
7	Supply of HT Metering Panels/Cubicles with complete accessories and protection arrangements	No	100		
8	Supply of all required installation materials including cables, lugs, glands, connectors, mounting hardware and other consumables necessary for complete system installation	LS	1		

9	Supply and provision of communication modules (NB-IoT/GPRS) enabling two-way communication between meters and AMI system, including necessary accessories for reliable operation under site conditions	No	1700		
10	Provision of SIM cards, activation, configuration and data connectivity required for communication of all meters with central system	No	1700		
11	Supply, installation and commissioning of Head End System (HES) for communication and control of meters	LS	1		
12	Supply and implementation of Meter Data Management (MDM) system for data processing and storage	LS	1		
13	Supply of application software including consumer management, reporting, prepaid system and dashboards	LS	1		
14	Provision of mobile application for field-level operation and monitoring	LS	1		
15	Complete system integration including configuration and integration with existing billing system of DPA	LS	1		
16	Installation of all types of meters at various locations including indoor/outdoor mounting, wall/panel mounting, wiring, termination, sealing, CT/PT connection, and integration with communication and AMI system as per site conditions	No	1700		
17	Testing and commissioning including meter testing, communication validation, system integration, and functional verification ensuring complete system readiness	No	1700		
18	Comprehensive Operation & Maintenance support from Year 2 to Year 10 including system, communication, and software support	Year	9		
Grand Total in Rs.					

(In word Rupees: \_\_\_\_\_ only).

**Note:** The Rates should be inclusive of all Taxes, Duties, Transportation, Insurance etc. But exclusive of GST.

Contractor with Seal and Signature

Executive Engineer (Electrical)  
Deendayal Port Authority

**Annexure II**

**Detailed Scope of work:**

**1. Survey, Assessment and Consumer Indexing**

The scope of work under this project shall include complete design, engineering, supply, installation, testing, commissioning, integration, and comprehensive maintenance of a Smart Metering System integrated with Advanced Metering Infrastructure (AMI) at Deendayal Port Authority (DPA). The work shall be executed on a turnkey basis and shall cover all categories of consumers including LT single phase, LT three phase, LT CT-operated, and HT consumers/feeders.

The contractor shall carry out a field survey of all metering locations as identified and provided by DPA. The survey shall be limited to verification of site conditions and collection of necessary inputs required for planning and execution of the smart metering system. This shall include physical verification of each location, accessibility, safety considerations, and suitability for installation of smart metering equipment. Any constraints related to space availability, mounting feasibility, or site accessibility shall be noted and brought to the attention of DPA. The identification and finalization of metering locations shall remain within the scope of DPA.

Based on the information provided by DPA and site verification, the contractor shall classify consumers into LT single phase, LT three phase direct-connected, LT CT-operated, and HT categories. This classification shall be carried out for appropriate meter selection and system configuration, and any discrepancies observed shall be reported to DPA.

The contractor shall record available information regarding connected load and contract demand based on inputs provided by DPA and limited site verification. This shall include recording of sanctioned load, broad assessment for selection of suitable meter type, and identification of cases requiring CT-operated or HT metering.

Basic verification of existing metering arrangements shall be carried out only to the extent required for installation planning. This shall include identification of existing meter type, availability of CTs/PTs, observation of mounting arrangements, and understanding of wiring layout for replacement or integration.

The contractor shall also carry out a communication feasibility survey at all identified locations to assess suitability of the communication system for reliable data transfer. This shall include assessment of signal strength, identification of weak or shadow areas, evaluation of environmental and physical constraints affecting communication, and identification of locations requiring special installation considerations such as external antennas or repositioning. The contractor shall prepare a location-wise communication feasibility report, classify locations based on communication status, and incorporate the findings into system design to ensure reliable data acquisition.

Based on the inputs provided by DPA and site verification, the contractor shall prepare a consolidated consumer database and deployment plan including consumer-wise details, mapping of metering points, finalization of meter types, and phase-wise installation planning. The deployment plan shall be submitted for approval prior to execution.

## **2. Design and Engineering**

The contractor shall carry out complete design and engineering of the Smart Metering System integrated with AMI based on inputs provided by DPA and findings of the field survey. The design shall ensure reliable operation, compatibility with existing systems, and suitability for site conditions.

The system architecture shall be designed to include smart meters, communication network, Head End System (HES), Meter Data Management (MDM), and application layer. The contractor shall define the complete data flow from field meters to the central system and further to the billing system, while ensuring scalability for future expansion and compatibility with existing IT and electrical infrastructure of DPA.

Appropriate metering schemes shall be developed for different categories including LT single phase, LT three phase, LT CT-operated, and HT metering. The contractor shall determine suitable meter ratings, specifications, CT/PT ratios, and prepare metering schemes in line with applicable standards and practices.

The communication system shall be designed using cellular technology such as NB-IoT / LTE / GPRS or equivalent, ensuring reliable data transmission. The communication architecture, hierarchy, and data transfer intervals shall be defined, and provisions identified during the communication feasibility survey shall be incorporated.

Electrical and installation design shall include preparation of meter mounting arrangements, installation layouts, design of metering panels for CT-operated and HT systems, wiring schemes, and consideration of earthing and safety requirements.

The contractor shall design the AMI software architecture including HES, MDM, and application modules. This shall include definition of data structures, database requirements, user access levels, and integration framework with the existing billing system of DPA, including mapping of consumer data and tariff structures.

All equipment and system design shall be suitable for port environmental conditions such as salinity, humidity, dust, and temperature variations. Adequate protection levels shall be ensured for outdoor installations, and long-term reliability shall be considered.

The contractor shall prepare and submit all design documents, drawings, and system architecture diagrams for review and approval by DPA. All comments shall be incorporated and final design shall be approved prior to execution.

## **3. Supply of Equipment**

The contractor shall be responsible for the supply of all equipment, materials, and accessories required for implementation of the Smart Metering System with AMI at DPA. All equipment supplied shall be new, of proven design, conforming to relevant IS/IEC standards, and suitable for operation under the environmental conditions prevailing at DPA.

The scope shall include supply of LT single phase smart meters of 240V, 5–60A range with accuracy class 1.0 or better, supporting prepaid and postpaid operation, remote connect/disconnect, load limiting, tamper detection, event logging, load survey, and communication capability through NB-IoT/GPRS or equivalent along with BLE support.

Supply shall also include LT three phase smart meters (3P4W, 415V) with suitable current range and accuracy class, supporting maximum demand measurement, load profiling, tamper detection, remote monitoring, and communication capability.

For higher load consumers, LT CT-operated smart metering systems shall be supplied as complete units including smart meter, matched CTs, metering panels/enclosures, and all

associated accessories required for installation. These systems shall support accurate measurement, load profiling, tamper detection, and remote communication.

HT metering systems shall be supplied for feeders and bulk consumers including trivector meters, CTs/PTs, metering panels, and associated equipment. These systems shall support measurement of active, reactive, and apparent energy, time-of-day metering, maximum demand recording, event logging, and compliance with applicable CEA requirements.

The scope shall also include supply of meter boxes, metering panels, mounting structures, wiring accessories, connectors, and sealing arrangements required for complete installation.

Communication infrastructure components including communication modules, SIM cards, data connectivity arrangements, and external antennas (where required) shall be provided to ensure reliable communication between meters and AMI system.

The contractor shall also supply AMI system components including Head End System (HES), Meter Data Management (MDM), application software, prepaid vending system, reporting tools, and mobile application for field operation.

Provision of IT infrastructure including server systems (cloud or on-premise), database, storage, backup solutions, and required licenses shall be included.

All equipment shall be compatible with each other and supplied with necessary documentation, test certificates, and supporting records. The contractor shall ensure that all supplied

#### **4. Installation and Site Execution**

The contractor shall carry out installation and site execution of the Smart Metering System at all locations identified and provided by Deendayal Port Authority (DPA), in accordance with approved drawings, specifications, and site conditions. All installation activities shall be planned and executed in a systematic manner to ensure safety, quality of workmanship, and minimal disruption to existing power supply and port operations. The contractor shall arrange all necessary tools, tackles, manpower, and consumables required for execution of the work.

Wherever required, dismantling of existing meters shall be carried out as per the instructions of DPA. The contractor shall ensure that such dismantling is performed carefully without causing damage to existing wiring, panels, or associated infrastructure. All dismantled meters and related materials shall be handed over to DPA as per directions.

Installation of LT single phase smart meters shall be carried out at designated consumer locations with proper mounting in suitable meter boxes. The contractor shall ensure correct connection of phase and neutral wiring, proper polarity, and secure fixing of the meter. Adequate sealing arrangements shall be provided to prevent tampering and to ensure integrity of the installation.

For LT three phase direct-connected consumers, smart meters shall be installed with proper mounting and alignment, ensuring correct phase sequence and voltage connections. The contractor shall verify all electrical parameters at the time of installation and ensure that the meter is functioning correctly before commissioning. Proper sealing and securing of the installation shall be ensured.

In case of LT CT-operated consumers, the contractor shall install the complete CT-operated metering system including meter, CTs, and enclosure as a combined unit. The CTs

shall be mounted on conductors or busbars as per site conditions, and proper wiring and termination shall be carried out. Special care shall be taken to verify CT polarity, ratio, and connections to ensure accurate measurement. The entire installation shall be properly enclosed and sealed.

For HT consumers and feeders, the contractor shall install HT Metering systems including trivector meters along with CTs, PTs, and associated panels. All connections shall be made as per approved metering scheme, and secondary wiring from CT/PT to Meter shall be properly terminated. The installation shall comply with applicable safety practices and utility requirements, and proper sealing shall be ensured.

The contractor shall also install all communication components required for AMI operation, including communication modules, SIM cards, and associated accessories. Where required, external antennas or suitable mounting arrangements shall be provided to ensure reliable communication. Proper positioning and configuration shall be ensured for effective data transmission.

All wiring, termination, and interconnections shall be carried out using appropriate materials and standard practices. The contractor shall ensure neat and systematic wiring, proper identification and labeling of cables, and secure termination of all connections. Adequate care shall be taken to ensure safety, reliability, and ease of maintenance.

After installation, the contractor shall ensure that all meters and associated systems are properly integrated with the communication network and AMI system. Any site-specific issues encountered during installation shall be brought to the notice of DPA for necessary guidance.

All installation activities shall be carried out in compliance with relevant standards, safety requirements, and approved procedures. The contractor shall ensure that the installed system is ready for testing and commissioning without any deficiencies.

## **5. Testing and Commissioning**

Upon completion of installation activities, the contractor shall carry out comprehensive testing and commissioning of the Smart Metering System to ensure proper functioning of all components and seamless integration with the Advanced Metering Infrastructure (AMI) system and existing billing system of DPA. All testing shall be carried out in accordance with applicable standards, approved procedures, and site requirements.

The contractor shall first undertake verification of individual meters to confirm correct installation and functionality. This shall include checking of wiring connections, polarity, phase sequence, voltage levels, and overall operational status of the meters. For LT single phase and three phase meters, proper measurement of electrical parameters and display functionality shall be verified. In case of LT CT-operated and HT metering systems, additional checks such as CT/PT ratio verification, polarity checks, and correctness of secondary wiring shall be carried out to ensure accuracy of measurement.

Communication testing shall be carried out to verify reliable data transfer from field meters to the central AMI system. The contractor shall ensure that each meter is successfully communicating with the Head End System (HES) and that data such as energy consumption, load profile, and event logs are being transmitted correctly. Communication performance, including data availability and response time, shall be verified under normal operating conditions.

The contractor shall also verify the functionality of remote operations supported by the system, including remote connect and disconnect, load limiting, and configuration updates.

Proper operation of prepaid and postpaid modes, wherever applicable, shall be checked to ensure correct system behavior. Event and tamper detection features shall also be tested to confirm proper recording and reporting of abnormal conditions.

Integration testing shall be carried out to ensure seamless data flow between the AMI system and the existing billing system of DPA. This shall include validation of meter data transfer, mapping of consumer details, and verification of billing parameters. The contractor shall demonstrate that the data generated from the meters is correctly processed and made available for billing purposes without discrepancies.

A system-level validation shall be performed to confirm end-to-end functionality, starting from data acquisition at meter level to its availability in the central system and billing platform. The contractor shall demonstrate proper functioning of software modules including HES, MDM, reporting tools, and user interface.

The contractor shall carry out joint inspection and testing in the presence of DPA representatives, and all test results shall be documented. Any defects or deficiencies observed during testing shall be rectified by the contractor before final acceptance.

Commissioning of the system shall be considered complete only after successful testing of all components, verification of communication and integration, and demonstration of overall system performance. The contractor shall ensure that the system is fully operational, stable, and ready for regular use.

All test reports, commissioning records, and relevant documentation shall be submitted to DPA as part of the completion process.

## **6. Communication Infrastructure**

The contractor shall design, supply, establish, and commission a reliable communication infrastructure for the Smart Metering System to enable seamless data exchange between field meters and the central Advanced Metering Infrastructure (AMI) system. The communication system shall be based on NB-IoT and/or GPRS technology and shall be suitable for operation under the site conditions prevailing at Deendayal Port Authority (DPA).

The communication infrastructure shall include provision of communication modules compatible with the smart meters, along with SIM cards and data connectivity required for transmission of data. The contractor shall ensure that all meters are configured for communication and are capable of transmitting data to the Head End System (HES) at defined intervals. The system shall support periodic data transfer, event-based communication, and on-demand data retrieval as required for operational and billing purposes.

The contractor shall take into account the findings of the communication feasibility survey while implementing the communication system. Appropriate installation practices shall be adopted to ensure reliable communication, including proper positioning of meters, use of external antennas where required, and avoidance of signal obstruction due to enclosures or surrounding structures. The objective shall be to achieve consistent and stable communication under normal operating conditions.

All communication between meters and the central system shall be secure and protected against unauthorized access. Suitable encryption and authentication mechanisms shall be implemented to ensure data integrity and confidentiality. The system shall support reliable transfer of data such as energy consumption, load profiles, tamper events, and system alerts.

The communication system and associated data handling shall comply with applicable

Government of India guidelines and regulations related to data protection, cybersecurity, and information security. Necessary provisions shall be incorporated to ensure secure data transmission, controlled access, and protection against unauthorized use, in line with prevailing standards and best practices.

Provision shall be made for monitoring the communication performance of the system, including status of connectivity, data availability, and identification of non-communicating meters. The contractor shall ensure that communication issues, if any, are identified and addressed during the implementation phase to achieve satisfactory system performance.

The communication infrastructure shall be integrated with the AMI system in such a manner that it supports continuous data acquisition, system monitoring, and remote operation of meters. The overall system shall be designed to ensure dependable communication, enabling effective functioning of the smart metering system across all locations.

Further, the communication system shall be designed with adequate flexibility to accommodate future integration with optical fiber-based communication network, wherever such infrastructure is developed by DPA. The system architecture and interfaces shall be compatible for migration or hybrid operation without requiring major modifications, thereby enabling enhanced reliability and higher data availability in future.

## **7. Advanced Metering Infrastructure (AMI) System**

The contractor shall design, supply, install, configure, and commission a complete Advanced Metering Infrastructure (AMI) system to enable centralized monitoring, control, and management of all smart meters installed under this project. The AMI system shall comprise Head End System (HES), Meter Data Management (MDM) system, and application software, and shall be capable of handling data from all categories of meters including LT single phase, LT three phase, LT CT-operated, and HT metering systems.

The Head End System (HES) shall act as the interface between field devices and the central system, and shall be responsible for communication with all installed meters. The HES shall support two-way communication, enabling collection of meter data as well as transmission of control commands such as remote connect and disconnect, configuration updates, and tariff-related changes. The system shall be capable of managing communication with a large number of meters and shall ensure reliable data acquisition at defined intervals.

The Meter Data Management (MDM) system shall be responsible for processing, validation, storage, and management of meter data received from the HES. The MDM shall perform functions such as validation, estimation, and editing (VEE) of data, and shall ensure that only accurate and consistent data is used for further processing and billing. The system shall maintain historical data records, support energy accounting, and enable analysis of consumption patterns, load profiles, and demand trends.

The application software shall provide a user-friendly interface for monitoring, control, and management of the metering system. It shall include modules for consumer management, meter management, tariff configuration, reporting, and system administration. The system shall support generation of various reports, dashboards, and alerts related to consumption, tamper events, outages, and system performance. The software shall be accessible through a web-based platform and shall support role-based access control.

The AMI system shall also include provision for prepaid functionality through a web-based vending system, enabling recharge and balance management for prepaid consumers. The system shall support seamless switching between prepaid and postpaid modes as required. A mobile application shall also be provided to enable field-level access to meter data,

basic diagnostics, and operational support.

The system shall be designed to integrate seamlessly with the existing billing system of DPA, ensuring automatic transfer of validated meter data for billing purposes. Proper mapping of consumer data, tariff structures, and billing parameters shall be ensured to maintain continuity of existing billing operations.

The AMI system shall be designed to support multiple communication technologies and shall be capable of accommodating future integration with optical fiber-based communication network. The system shall be scalable to support additional meters and functionalities as required in future.

Appropriate cybersecurity measures shall be implemented within the AMI system to ensure data protection, secure access, and system integrity. The system shall comply with applicable Government of India guidelines related to data protection and cybersecurity, and shall include provisions for user authentication, data encryption, and secure data storage.

The contractor shall ensure complete configuration, testing, and commissioning of the AMI system, including integration with field devices and communication infrastructure. The system shall be demonstrated to be fully functional, reliable, and ready for operational use.

## **8. Integration with Existing Billing System**

The contractor shall ensure seamless integration of the Smart Metering System and Advanced Metering Infrastructure (AMI) with the existing billing and revenue management system of Deendayal Port Authority (DPA). The integration shall be carried out in a manner that ensures continuity of existing billing processes while improving accuracy, efficiency, and automation in data handling.

The system shall enable automatic transfer of validated meter data from the AMI system to the billing platform without the need for manual intervention. All relevant parameters required for billing purposes, including energy consumption, maximum demand, time-of-day data, and other applicable billing determinants, shall be made available in the required format. The integration shall be designed to ensure that data is consistently available for billing cycles and reflects actual consumption recorded at the meter level.

The contractor shall configure the system to align with the existing consumer database, tariff structures, and billing categories of DPA. Necessary data mapping and configuration shall be carried out to ensure that the AMI system and billing system operate in coordination without discrepancies. The existing billing workflows shall remain functional, with improved data accuracy and reduced dependency on manual processes.

The integration shall support both prepaid and postpaid modes of operation. For prepaid consumers, recharge and balance information shall be reflected appropriately within the system, while for postpaid consumers, consumption data shall be accurately transferred for billing. The system shall also support flexibility for switching between prepaid and postpaid modes as required.

The contractor shall implement suitable interfacing mechanisms such as APIs or web-based services to enable secure and reliable exchange of data between the AMI system and the billing platform. Data transfer shall be carried out at defined intervals or as per billing cycle requirements, ensuring timely availability of information.

Appropriate data validation processes shall be ensured within the AMI system prior to transfer of data for billing purposes. The system shall maintain consistency, integrity, and traceability of data, enabling audit and verification as required. Any discrepancies observed

during data transfer or processing shall be identified and addressed during the implementation phase.

The contractor shall carry out integration testing, including end-to-end validation of data flow from meter to billing system. This shall include verification of data accuracy, billing parameter mapping, and system response under actual operating conditions. The system shall be considered successfully integrated only after satisfactory demonstration of accurate and reliable data transfer for billing.

Necessary documentation related to integration, including data mapping, interface details, and operational procedures, shall be provided. Training shall also be imparted to DPA personnel for effective use and management of the integrated system.

## **9. IT Infrastructure & Cybersecurity**

The contractor shall provide, configure, and commission the necessary IT infrastructure required for operation of the Smart Metering System and Advanced Metering Infrastructure (AMI). The infrastructure shall be designed to ensure reliable system performance, secure data handling, and scalability for future expansion. The system may be deployed on cloud-based or on-premise servers, as per project requirements, and shall be capable of handling data from all connected meters without performance degradation.

The IT infrastructure shall include provisioning of servers, databases, storage systems, and associated software required for operation of Head End System (HES), Meter Data Management (MDM), and application modules. The system shall be designed to ensure high availability, adequate processing capability, and efficient data storage and retrieval. Necessary provisions for system backup and data recovery shall be incorporated to prevent loss of data and to ensure continuity of operations in case of system failure.

The contractor shall implement structured database management practices to ensure integrity, consistency, and efficient handling of large volumes of metering data. Historical data shall be stored in an organized manner to support reporting, analysis, and audit requirements. The system shall be capable of handling interval data, event logs, and long-term data storage without performance issues.

Appropriate cybersecurity measures shall be implemented to safeguard the system against unauthorized access, data breaches, and cyber threats. The system shall include provisions for user authentication, role-based access control, password management, and controlled user privileges. Data communication between field devices and central systems, as well as internal data exchange within the system, shall be secured through encryption and secure protocols.

The system shall be designed and implemented in compliance with applicable Government of India guidelines and standards related to data protection, cybersecurity, and information security. The contractor shall ensure that the system adheres to prevailing best practices, including protection of sensitive data, secure storage, and controlled access mechanisms.

Provision shall be made for regular backup of system data, with defined backup frequency and retention policy. Mechanisms for restoration of data in case of failure or data loss shall be established and tested. The system shall ensure minimal downtime and quick recovery in case of any disruptions.

The contractor shall also provide necessary system monitoring tools to track performance of IT infrastructure, including server health, database performance, and system usage. Any issues related to system performance or security shall be identified and addressed

in a timely manner.

The overall IT infrastructure shall be designed to support integration with existing and future systems of DPA, including billing systems and other digital platforms. The system shall be scalable and adaptable to accommodate future enhancements, including expansion of metering network and integration with advanced communication systems such as optical fiber network.

## **10. Operation and Maintenance (AMC)**

The contractor shall provide comprehensive Operation and Maintenance support for the Smart Metering System and Advanced Metering Infrastructure (AMI) for a total period of 10 (ten) years from the date of commissioning. The objective shall be to ensure reliable system performance, continuity of operations, and sustained functionality of all components over the project lifecycle.

The Operation and Maintenance support for the first year after commissioning shall be provided free of cost as part of the project scope. Thereafter, Operation and Maintenance support for the remaining period shall be provided on a chargeable basis as per agreed terms.

The scope of AMC shall include routine monitoring and maintenance of smart meters, communication infrastructure, and AMI system components including Head End System (HES), Meter Data Management (MDM), and application software. The contractor shall attend to faults or issues reported during operation and shall take necessary corrective actions to restore normal functioning of the system.

Preventive maintenance activities shall be carried out at defined intervals to ensure proper functioning of meters, communication modules, and system components. The contractor shall also address issues related to non-communicating meters, data gaps, and system alerts to maintain overall system performance and data availability.

The AMC shall include technical support for system operation, troubleshooting of communication or software-related issues, and necessary updates required for smooth functioning of the system. Any defective components identified during the AMC period shall be repaired or replaced to ensure continuity of operations.

The overall system shall be maintained in a manner that ensures reliable communication, accurate data acquisition, and seamless integration with the billing system throughout the AMC period.

### **Annexure III**

#### **Technical Specification**

This specification covers the design, manufacturing, testing, supply and delivery of AC whole current, single phase, two wires, smart prepayment energy meter with bidirectional communication option & remote connect/disconnect switch along with external enclosure. The meter shall communicate with Head End System (HES) on any one of the communication technologies covered in IS16444 Part 1, as per the requirement of the utility. Smart meter shall support import & export mode along with unidirectional (absolute) mode.

Key functionalities of smart meter include:

The Smart Meter would have the following minimum basic features-

- Bidirectional Communication

- Integrated connect/disconnect switch in phase and neutral
- Tamper event detection and logging
- Prepayment features
- Remote firmware upgrade

**1. Specification For Single Phase Smart Prepay Keypad Type Energy Meter:**

**1.1 Standard:**

The meters with accuracy class 1.0 are required for measurement of Active Energy and shall conform to the latest edition of following standards: —

IS:13779 with latest amendments	A.C. Static Watt Hour Meters (Class 1.0 and 2.0)
IS:15884 with latest amendments	AC Direct Connected Static Prepayment Meters for Active Energy (Class 1 and Class 2)- specifications
IS 16444 Part 1 with latest amendments	A.C. Static Direct Connected Watt Hour Smart Meter (Class 1 and Class 2) – Specification
IS:15959 (Part 2) with latest amendments	Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification

**1.2 Climatic Conditions:**

The meter is required to operate satisfactorily and continuously with specified accuracy under hot, dusty and tropical conditions and other climatic condition specified as herein after: —

1)	Specified operating range	-10°C to + 55°C
2)	Limit range of operation	-25°C to + 55°C
3)	Limit range of storage and Transport	-25°C to + 70°C
4)	Relative Humidity (Non condensing)	Up to 95 %
5)	Maximum attitude above M.S.I.	1000 Meter

**1.3 Current And Voltage Rating:**

Rated Voltage (Vref) : 240 V Phase to Neutral

Rated Current : Basic Current 5A ( $I_b$ )

Maximum current 60A ( $I_{max}$ )

**1.4 Variation In Power Supply:**

The meters shall be suitable for working satisfactorily with the following power supply system variations: —

<b>System</b>	<b>1 Phase 2 Wire</b>
Specified range of operation	70% to 130% of reference Voltage i.e. 240 V
Frequency	50Hz $\pm$ 5%

If phase to phase voltage i.e. 415V is applied continuously between phase and neutral of

the meter, the meter should not get damaged and continue to record after restoration of normal supply.

### **1.5 Power Consumption:**

#### **1.5.1 Voltage Circuit:**

The active and apparent power consumption in voltage circuit including the power supply of the meter at reference voltage, reference temperature and reference frequency shall be within limit as specified in IS-16444.

#### **1.5.2 Current Circuit:**

The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall be within limits as specified in IS-16444.

### **1.6 Starting Current:**

The meter shall start registering the energy at 0.4% of  $I_b$  or better as per IS-16444.

### **1.7 Maximum Continuous Current**

The rated maximum current for the meter shall be 100% of  $I_{max}$  at which the meter meets the accuracy requirement. However, meter terminals should be suitable to carry 120% of  $I_{max}$  for 2 Hrs.

### **1.8 Accuracy:**

Class of accuracy of meter shall be 1.0 and shall conform to accuracy requirement as per IS-16444.

### **1.9 Display & Keypad:**

The measured value(s) shall be displayed on Liquid Crystal display (LCD) display. LCD should contain the suitable legends and parameter identifier suitable for prepay metering application

- For accessing display, meter shall have keypad. Logical grouping shall be done on individual keys
- The keypad buttons shall have numbers, which shall be clearly visible and resistant to wear. The keypad button shall be of capacitive touch type for ease of use. Button '5' shall have some form of physical identification (raised printing or a pip) to facilitate customers with poor sight. The meter shall permit a time delay of up to 20 seconds between subsequent keystrokes for smooth entry.
- Meter shall support the prepayment top-up through keypad as well. It should be treated as backup channel in case of remote communication absence.
- The register shall be able to record for a minimum of 1500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor. The energy register should not roll over in between this duration.

#### **Display Sequence**

The meter shall display the required parameters in two different modes as follows:

##### **A. Auto Display Mode:**

The following parameters shall be displayed in an auto-cycle mode, in the following sequence:

- LCD Test

- Real Time and Date
- Balance account in monetary terms
- Days left
- Last day consumption in monetary terms
- Bill 1 Active forwarded energy or import-export (kWh)
- Bill 1 Maximum demand in kW

**B. Actuator Mode (Logical display grouping on keypad)**

- Account information in monetary terms (Balance, days left etc.)
- Current and bill 1 energy parameters
- Current and bill 1 demand parameters
- Instantaneous parameters
- Tariff information
- Vend top-up information
- Tamper information

**1.10 Energy Registers and Maximum Demand:**

1.10.1 Energy Registers

The smart meter shall be capable to record active forwarded energy as per application. Meter shall have provision to configure on active net energy along with active import-export for renewable application.

1.10.2 Maximum Demand Registration & History

Meter shall continuously monitor & calculate the average maximum demand for each demand interval time of 30 minutes and maximum of these in a calendar month shall be stored along with date and time when it occurred. The maximum demand shall automatically reset at 24:00 hrs. of the last date of each calendar month. The billing purpose parameters (energies and maximum demand) shall be registered and shall be available for a last 6 billing cycles.

1.10.3 Time of Use Monitoring

The meter shall offer the capability of time of use monitoring for energy. The rate registers shall be capable of being configured for TOD monitoring for Peak/Off peak hours.

1.10.4 Load Profile Recording

The meter shall be capable of monitoring and recording load profile information for active energy for every 30-minute interval for at least 45 days' duration as defined in IS 16444.

1.10.5 MIDNIGHT ENERGY SNAPSHOT RECORDING

The meter shall be capable of recording energy snapshot for at least 35 days.

1.10.6 Auto Reset of MD

The meter shall be capable to perform auto reset of MD at 00:00 hrs, 1st of every month.

**1.11 Tariff:**

The meter has suitable provision to configure tariff related parameters covered below. The online prepayment system shall have tariff definition in web-based application.

It shall be possible to change the tariff related parameters through proper authentication.

- 1.11.1 Slab Tariff: The meter shall have capability for defining minimum four tariff slabs.
- 1.11.2 Fixed Charges: Meter shall be able to deduct fixed charges on daily basis such as meter rent, sanctioned load as per applicable tariff. The fixed charges shall be defined using the vending system.
- 1.11.3 Time of Day (TOD) Tariff: The meter shall have facility for recording and storing of active forwarded TOD consumption on minimum four tariff rates on per day basis.
- 1.11.4 Tax/Duty: The meter shall have provision to deduct tax on energy consumed.
- 1.11.5 Minimum charges: it shall be possible to define the minimum charge linked to energy consumption for the applicable tariff category. If the consumer consumes electricity equivalent of amount less than the minimum charge then at the end of the billing period, the meter shall deduct the difference of the minimum amount and the monthly consumption (Amount).

The tariff definition for prepayment metering system shall be mutually agreed between utility and supplier to facilitate ease of understanding of consumption information for consumer.

#### **1.12 Communication Capability:**

- 1.12.1 Optical port – The meter shall have a galvanically isolated optical communication IEC 1107 port for local data communication. The optical port provided on the meter shall have the capability to transmit the data by connecting the external cable.
- 1.12.2 Communication module – The Smart meter shall have bi-directional communication module which shall integrate with meter. The communication module shall accommodate Cellular communication such as NB-IoT / LTE / GPRS or equivalent as per IS 16444 technology for bi-directional comms with HES. Meter shall be capable to record the communication module removal as an event.
- 1.12.3 Consumer interface – The meter shall have suitable provision for consumer token entry in case of NO WAN scenario and consumption information monitoring through mobile app. The mobile app connection to meter shall be through Bluetooth (4.1 onwards) communication.

#### **1.13 Prepay Functionalities**

- 1.13.1 Low credit warning – Meter should be capable to generate low credit alert for consumer and pass the alert information on mobile app/ IHD. Limit of low credit alert should be configurable by consumer itself.
- 1.13.2 Friendly credit facility – Meter should support facility for non-disconnection of load on specified dates or holidays and non-working hrs as specified by utility even during low/zero/negative balance.
- 1.13.3 Emergency credit function – The meter shall have provision of emergency credit limit as specified or configured by Utility for specific customer segment which may allow to use credit during low/zero balance.
- 1.13.4 Load limiting – The meter shall have provision of load limiting functionality to limit the consumer load linked to sanctioned load.

1.13.5 Balance refund mechanism –The meter shall have provision to generate balance refund code in case of connection surrender request by consumer.

1.13.6 Switch functionality & utilization category – Connect-disconnect switch of meter should support the UC1 or better category compliance as per IS 15884 owing to additional load switching capabilities.

1.13.7 To facilitate the consumer for consumption monitoring and vend token transactions in offline mode, mobile app/IHD shall be supported by smart metering system.

1.13.8 The prepayment functionalities shall comply with IS 15884 standard.

#### **1.14 Test output device:**

The meter shall have a test output accessible from the front and capable of being monitored with suitable testing equipment while in operation at site. The test output device shall be provided in the form of LED output.

The relation between test output and the indication on display shall comply with the marking on the name plate (imp per kWh).

#### **1.15 General Requirements**

1.15.1 Meter shall be designed and constructed in such a way as to avoid causing any danger in use and under normal conditions. However, the following should be ensured-

- Personnel safety against electric shock
- Personnel safety against effects of excessive temperature.
- Protection against penetration of solid objects, dust and water.
- Protection against spread of fire.

1.15.2 The meter shall be designed with application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH technology. The meter should be housed in a safe, high grade engineering Polycarbonate casing of projection mounting type.

1.15.3 All insulating material used in the construction of meter shall be non-hygroscopic, non-ageing and of tested quality and shall conform to tests as specified in relevant Standards.

1.15.4 The meter shall be supplied with terminal cover to protect the direct access of live terminals. The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic overload of live parts in contact with them.

1.15.5 The meter shall at least conform to the degree of protection IP 54 or better for protection against ingress of dust, moisture and vermin.

1.15.6 All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to change by ordinary handling due to exposure to air under normal working conditions.

1.15.7 The meters shall be designed such that their working remains unaffected by passing direct current, electromagnetic interference, electrostatic discharges and high voltage transients as specified in standard.

1.15.8 The meter shall be compact in design. The entire construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.

### **1.16 Constructional Requirements:**

#### 1.16.1 Meter Case:

- The meter shall have completely insulated body and be of wall mounted projected type. The meter shall have a case made of unbreakable high-grade fire resistant, reinforced polycarbonate or equivalent high-grade engineering plastic which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the meter cover seals. The meter cover shall have at least two sealing provisions.
- The meter case shall have at least three mounting holes. Two holes for mounting screws on the terminal block sealed beneath the terminal cover and one for hanging screw on the top.
- The meter case shall support break to open functionality in such a way that it should not be possible to open the meter cover without damaging the cover. The base and cover shall be ultra-sonically/chemically welded.

#### 1.16.2 LCD Unit:

The measured value(s) shall be displayed on minimum six-digit LCD display. The height of the digit shall be minimum 8 mm. Each display shall be retained for a minimum period of 2 seconds.

#### 1.16.3 Window:

The meter cover shall be of high grade, fire resistant, reinforced polycarbonate or equivalent high-grade engineering plastic with one window made of UV stabilized, silicon coated polycarbonate or equivalent high-grade engineering plastic for reading the register. The window shall be an integral part of the meter cover such that it cannot be removed undamaged without breaking the meter cover.

#### 1.16.4 Terminals and Terminals block:

- The terminal block shall be made of unbreakable, high grade non-flammable polycarbonate or equivalent high grade and good quality engineering plastic. The terminal block should have terminal holes and shall be of sufficient size to accommodate the conductors, meeting the requirement of IS 16444
- The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.
- Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.
- The meter shall be provided with terminal to connect the cables. The screws shall not have pointed edge at the end of thread. The clearance and creep age distance of terminal

block and tips between the terminal and the surrounding parts of metal enclosure shall be as per IS16444 standard.

#### 1.16.5 Terminal Cover & Connection diagram:

The meter terminal block shall be provided with an extended terminal cover with independent sealing arrangement in such a way that it shall cover the terminals, the conductor fixing screws and their insulation.

The connection diagram of the meter shall be clearly shown on terminal cover and should be permanent in nature.

#### 1.16.6 Name Plate Marking: (as per IS)

The name plate should be as per IS and shall have following markings which shall be indelible, distinct and readable from outside the meter: —

- Manufacturer's name and/or trademark and the place (with country) of manufacture;
- Designation of type;
- The no. of phases and no. of wires for which the meter is suitable for;
- The manufacturer's serial number and year of manufacture;
- Reference voltage;
- The basic current and the maximum current;
- The principal unit in which the meter reads;
- Meter constant;
- Accuracy Class;
- Reference Frequency;
- Standard and BIS marking

### **1.17 Load Survey Parameters**

The array of data to be retained inside the meter memory shall be for the **45** days for a capture period of 30 minutes for maximum 10 configured parameters. The load survey data shall be first in first out basis (FIFO). Load survey data shall be logged on non-time based basis, i.e. if there is no power for more than 24 hours, the day shall not be recorded. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. The load survey data can be retrieved as and when desired and load profiles shall be viewed graphically / analytically with the help of meter application software. The meter application software shall be capable of exporting / transmitting these data for analysis to other user software in spreadsheet format. The load survey parameters are as below.

<b>1.</b>	Real Time Clock – Date and Time
<b>2.</b>	Neutral Line Current
<b>3.</b>	Average voltage
<b>4.</b>	Average line current

<b>5.</b>	Temperature
<b>6.</b>	Block Energy – kWh
<b>7.</b>	Block Energy – kVAh – lag
<b>8.</b>	Block Energy – kVAh – lead
<b>9.</b>	Block Energy – kVAh

### **1.18 Tamper and Fraud Protection:**

The meter shall record events under the following tamper conditions:

- a. Drawing of current through local earth: The meter shall log an event if the load is not terminated back to the meter and instead current is drawn partially or fully through a local earth irrespective of the phase and neutral connections to the meter.
- b. Phase current reversal at supply side: The meter shall record forwarded energy when phase and neutral are reversed at the supply side.
- c. Phase and Neutral are connected at load side: The meter shall not power-up and state of the switch should be in disconnected state.
- d. If neutral is disconnected from both supply & load side: The meter shall not power up and switch shall be in disconnected state.

The meter operation under different tamper conditions is listed below:

- The meter shall operate normally in case the phase and neutral are swapped at the supply side and load is taken w.r.t. to earth. Suitable event should be recorded by meter with date and time stamp.
- The meter shall comply with the accuracy under magnet influences as per relevant IS 13779. There should be provision for defrauded registration ( $V_{actual} \times I_{max} \times \text{unity p.f.}$ ) under magnetic influence.
- Spark Influence: The meter accuracy shall not be affected on application of 35 kV spark. The accuracy of the meter shall be verified before & after the application of Spark device.
- The meter shall have measuring element for both phase and neutral to avoid tampering with neutral. The energy measurement shall always be done on the element with higher current.
- Meter Cover Open detection: Meter shall log the event with date and time in meter memory in case of meter cover open under mains on and off condition.
- Neutral Disturbance: Meter should log the event of neutral disturbance in case influence through injection of spurious signal in neutral terminal and should perform deficiency metering ( $V_{ref} \times I_{actual} \times \text{unity p.f.}$ )

### **1.19 Minimum Testing Facilities:**

The manufacturer shall have facilities of conducting acceptance testing as per IS16444 Part1

### **1.20 Tests**

The test reports/certificate/records for all type tests specified having been successfully performed on the type of the meter offered shall be submitted with the tender. The bidder shall clearly bring out the deviations from this specification clause by clause whether on account of tests or manufacturing process or features

incorporated in the meter. The tender lacking with above information and without supporting test reports for meter meeting the requirement of tests laid in this specification are likely to be rejected.

a) Type Tests

The Energy meter offered shall be fully type tested at any accredited test laboratory as per IS 16444 but test reports and shall not be more than 3 years old. The bidder shall furnish type test reports along with the bid.

b) Acceptance Test

All acceptance tests as stipulated in the relevant standards shall be carried out by the supplier in the presence of the purchaser's representative.

c) Routine Tests

All routine tests as stipulated in the relevant standards shall be carried out and routine test-certificates/reports shall be submitted to the purchaser for approval and also placed inside individual meter packing.

**Guaranteed Technical Specification for Single Phase Smart Prepay Meters**

S. No.	Description	Requirement	Offered
1.	Type of the meter	Single phase two wire, smart prepayment meter-direct reading type without application of any multiplication constant	
2.	Standard compliance	IS 16444, IS 13779	
3.	Accuracy Class	1.0	
4.	Basic Current (Ib) & rated Maximum current (Imax)	Ib= 5A; Imax= 60 Amps	
5.	Operating Voltage	Meter shall be operational with required accuracy from 0.7Vref to 1.3Vref for ref. voltage of 240V.	
6.	Operating Frequency	50 Hz. ± 5%.	
7.	Power Consumption	Voltage & current circuit: As per IS16444 standard.	
8.	Starting Current	As per IS16444	
9.	Connect disconnect switch compliance	UC1 or higher due to load switching capability as per IS 15884	
10.	Communication	Optical port – IEC 1107 Bi-directional remote comms – NBIoT cellular comms (fallback to GPRS)	
11.	Consumer interface option	Mobile App (optional)	
12.	Terminals withstand capability	120% of Imax for 2 Hrs.	
13.	Resistance to heat and fire	As Per relevant IS standard	
14.	Connection Diagram	The connection diagram shall be provided on terminal cover and should be permanent in nature	

15.	Internal diameter of the terminal holes	Min 8.0 mm	
16.	Clearance between adjacent terminals	As per IS 16444	
17.	Display	LCD display with minimum six digit	
18.	Keypad	Meter shall have capacitive touch type keypad functionality	
19.	Metrology LED	One LED support for accuracy testing for configured energy	
20.	Ingress Protection	IP54 or better	
21.	Break to open functionality	Physical evidence on forcibly opening of case/cover along with cover open detection event	
22.	Prepayment functionality	As specified in relevant clause	
23.	Display parameter support	As specified in relevant clause	
24.	Display interface	Keypad	
25.	Tamper & fraud protection	As specified in relevant clause	
26.	The system shall comply with cybersecurity standards, which focuses on Privacy Information Management Systems (PIMS) to ensure the protection of Personally Identifiable Information (PII).	As per ISO/IEC 27701	
27.	Certification from IT & Cyber security division of Ministry of Power	MTCTE Certification required	

### **Specification for Three Phase Smart Prepay Keypad Type Energy Meter:**

#### **1.21 Standard:**

The meters with accuracy class 1.0 are required for measurement of Active Energy and shall conform to the latest edition of following standards: –

IS:13779 with latest amendments	A.C. Static Watt Hour Meters (Class 1.0 and 2.0)
IS:15884 with latest amendments	AC Direct Connected Static Prepayment Meters for Active Energy (Class 1 and Class 2)- specifications
IS 16444 Part 1 with latest amendments	A.C. Static Direct Connected Watt Hour Smart Meter (Class 1 and Class 2) – Specification
IS:15959 (Part 1 & Part 2) with latest amendments	Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification

#### **1.22 Climatic Conditions:**

The meter is required to operate satisfactorily and continuously with specified accuracy under

hot, dusty and tropical conditions and other climatic condition specified as herein after: —

6)	Specified operating range	-10°C to + 55°C
7)	Limit range of operation	-25°C to + 55°C
8)	Limit range of storage and Transport	-25°C to + 70°C
9)	Relative Humidity (Non condensing)	Up to 95 %
10)	Maximum attitude above M.S.I.	1000 Meter

**1.23 Current and Voltage Rating:**

Rated Voltage (Vref) : 3 x 240 V Phase to Neutral  
 Rated Current : Basic Current 10A ( $I_b$ )  
 Maximum current 100A ( $I_{max}$ )

**1.24 Variation in Power Supply:**

The meters shall be suitable for working satisfactorily with the following power supply system variations: —

<b>System</b>	<b>3 Phase 4 Wire</b>
Specified range of operation	70% to 130% of reference Voltage i.e. 240 V
Frequency	50Hz $\pm$ 5%

If phase to phase voltage i.e. 415V is applied continuously between phase and neutral of the meter, the meter should not get damaged and continue to record after restoration of normal supply.

**1.25 Power Consumption:**

**1.25.1 Voltage Circuit:**

The active and apparent power consumption in voltage circuit including the power supply of the meter at reference voltage, reference temperature and reference frequency shall be within limit as specified in IS-16444.

**1.25.2 Current Circuit:**

The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall be within limits as specified in IS-16444.

**1.26 Starting Current:**

The meter shall start registering the energy at 0.4% of  $I_b$  or better as per IS-16444.

**1.27 Maximum Continuous Current**

The rated maximum current for the meter shall be 100% of  $I_{max}$  at which the meter meets the accuracy requirement. However, meter terminals should be suitable to carry 120% of  $I_{max}$  for 2 Hrs.

**1.28 Accuracy:**

Class of accuracy of meter shall be 1.0 and shall conform to accuracy requirement as per IS-16444.

**1.29 Display & Keypad:**

The measured value(s) shall be displayed on Liquid Crystal display (LCD) display. LCD should contain the suitable legends and parameter identifier suitable for prepay metering application

- For accessing display, meter shall have keypad. Logical grouping shall be done on individual keys
- The keypad buttons shall have numbers, which shall be clearly visible and resistant to wear. The keypad button shall be of capacitive touch type for ease of use. Button '5' shall have some form of physical identification (raised printing or a pip) to facilitate customers with poor sight. The meter shall permit a time delay of up to 20 seconds between subsequent keystrokes for smooth entry.
- Meter shall support the prepayment top-up through keypad as well. It should be treated as backup channel in case of remote communication absence.
- The register shall be able to record for a minimum of 1500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor. The energy register should not roll over in between this duration.

### **Display Sequence**

The meter shall display the required parameters in two different modes as follows:

#### **C. Auto Display Mode:**

The following parameters shall be displayed in an auto-cycle mode, in the following sequence:

- LCD Test
- Real Time and Date
- Balance account in monetary terms
- Days left
- Last day consumption in monetary terms
- Bill 1 Active forwarded energy or import-export (kWh)
- Bill 1 Maximum demand in kW
- Bill 1 Apparent forwarded energy (kVAh)
- Bill 1 Maximum demand in kVA

#### **D. Actuator Mode (Logical display grouping on keypad)**

- Account information in monetary terms (Balance, days left etc.)
- Current and bill 1 energy parameters
- Current and bill 1 demand parameters
- Instantaneous parameters
- Tariff information
- Vend top-up information
- Tamper information

### **1.30 Energy Registers and Maximum Demand:**

#### **1.30.1 Energy Registers**

The smart meter shall be capable to record active forwarded energy as per application. Meter shall have provision to configure on active net energy along with active import-export for renewable application.

#### **1.30.2 Maximum Demand Registration & History**

Meter shall continuously monitor & calculate the average maximum demand for each demand interval time of 30 minutes and maximum of these in a calendar month shall be stored along with date and time when it occurred. The maximum demand shall automatically reset at 24:00 hrs. of the last date of each calendar month. The billing purpose parameters (energies and maximum demand) shall be registered and shall be available for a last 6 billing cycles.

#### 1.30.3 Time of use Monitoring

The meter shall offer the capability of time of use monitoring for energy. The rate registers shall be capable of being configured for TOD monitoring for Peak/Off peak hours.

#### 1.30.4 Load Profile Recording

The meter shall be capable of monitoring and recording load profile information for active energy for every 30-minute interval for at least 45 days' duration as defined in IS 16444.

#### 1.30.5 Midnight Energy Snapshot Recording

The meter shall be capable of recording energy snapshot for at least 35 days.

#### 1.30.6 Auto Reset of MD

The meter shall be capable to perform auto reset of MD at 00:00 hrs, 1st of every month.

### **1.31 Tariff:**

The meter has suitable provision to configure tariff related parameters covered below. The online prepayment system shall have tariff definition in web-based application.

It shall be possible to change the tariff related parameters through proper authentication.

1.31.1 Slab Tariff: The meter shall have capability for defining minimum four tariff slabs.

1.31.2 Fixed Charges: Meter shall be able to deduct fixed charges on daily basis such as meter rent, sanctioned load as per applicable tariff. The fixed charges shall be defined using the vending system.

1.31.3 Time of Day (TOD) Tariff: The meter shall have facility for recording and storing of active forwarded TOD consumption on minimum four tariff rates on per day basis.

1.31.4 Tax/Duty: The meter shall have provision to deduct tax on energy consumed.

1.31.5 Minimum charges: it shall be possible to define the minimum charge linked to energy consumption for the applicable tariff category. If the consumer consumes electricity equivalent of amount less than the minimum charge then at the end of the billing period, the meter shall deduct the difference of the minimum amount and the monthly consumption (Amount).

The tariff definition for prepayment metering system shall be mutually agreed between utility and supplier to facilitate ease of understanding of consumption information for consumer.

### **1.32 Communication Capability:**

1.32.1 Optical port – The meter shall have a galvanically isolated optical communication IEC 1107 port for local data communication. The optical port provided on the meter shall have the capability to transmit the data by connecting the external cable.

- 1.32.2 Communication module – The Smart meter shall have bi-directional communication module which shall integrate with meter. The communication module shall accommodate Cellular communication such as NB-IoT / LTE / GPRS or equivalent as per IS 16444 technology for bi-directional comms with HES. Meter shall be capable to record the communication module removal as an event.
- 1.32.3 Consumer interface – The meter shall have suitable provision for consumer token entry in case of NO WAN scenario and consumption information monitoring through mobile app. The mobile app connection to meter shall be through Bluetooth (4.1 onwards) communication.

### **1.33 Prepay Functionalities**

- 1.33.1 Low credit warning – Meter should be capable to generate low credit alert for consumer and pass the alert information on mobile app/ IHD. Limit of low credit alert should be configurable by consumer itself.
- 1.33.2 Friendly credit facility – Meter should support facility for non-disconnection of load on specified dates or holidays and non-working hrs as specified by utility even during low/zero/negative balance.
- 1.33.3 Emergency credit function –The meter shall have provision of emergency credit limit as specified or configured by Utility for specific customer segment which may allow to use credit during low/zero balance.
- 1.33.4 Load limiting –The meter shall have provision of load limiting functionality to limit the consumer load linked to sanctioned load.
- 1.33.5 Balance refund mechanism –The meter shall have provision to generate balance refund code in case of connection surrender request by consumer.
- 1.33.6 Switch functionality & utilization category – Connect-disconnect switch of meter should support the UC1 or better category compliance as per IS 15884 owing to additional load switching capabilities.
- 1.33.7 To facilitate the consumer for consumption monitoring and vend token transactions in offline mode, mobile app/IHD shall be supported by smart metering system.
- 1.33.8 The prepayment functionalities shall comply with IS 15884 standard.

### **1.34 Test Output Device:**

The meter shall have test output accessible from the front and capable of being monitored with suitable testing equipment while in operation at site. The test output device shall be provided in the form of LED output.

The relation between test output and the indication on display shall comply with the marking on the name plate (imp per kWh and imp per kVAh).

### **1.35 General Requirements**

- 1.35.1 Meter shall be designed and constructed in such a way as to avoid causing any danger in use and under normal conditions. However, the following should be ensured-
- Personnel safety against electric shock
  - Personnel safety against effects of excessive temperature.

- Protection against penetration of solid objects, dust and water.
  - Protection against spread of fire.
- 1.35.2 The meter shall be designed with application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH technology. The meter should be housed in a safe, high grade engineering Polycarbonate casing of projection mounting type.
- 1.35.3 All insulating material used in the construction of meter shall be non-hygroscopic, non-ageing and of tested quality and shall conform to tests as specified in relevant Standards.
- 1.35.4 The meter shall be supplied with terminal cover to protect the direct access of live terminals. The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic overload of live parts in contact with them.
- 1.35.5 The meter shall at least conform to the degree of protection IP 51 or better for protection against ingress of dust, moisture and vermin.
- 1.35.6 All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to change by ordinary handling due to exposure to air under normal working conditions.
- 1.35.7 The meters shall be designed such that their working remains unaffected by passing direct current, electromagnetic interference, electrostatic discharges and high voltage transients as specified in standard.
- 1.35.8 The meter shall be compact in design. The entire construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.

### **1.36 Constructional Requirements:**

#### 1.36.1 Meter Case:

- The meter shall have completely insulated body and be of wall mounted projected type. The meter shall have a case made of unbreakable high-grade fire resistant, reinforced polycarbonate or equivalent high-grade engineering plastic which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the meter cover seals. The meter cover shall have at least two sealing provisions.
- The meter case shall have at least three mounting holes. Two holes for mounting screws on the terminal block sealed beneath the terminal cover and one for hanging screw on the top.
- The meter case shall support break to open functionality in such a way that it should not be possible to open the meter cover without damaging the cover. The base and cover shall be ultra-sonically/chemically welded.

#### 1.36.2 LCD Unit:

The measured value(s) shall be displayed on minimum six-digit LCD display. The height of the digit shall be minimum 8 mm. Each display shall be retained for a minimum period of 2

seconds.

#### 1.36.3 Window:

The meter cover shall be of high grade, fire resistant, reinforced polycarbonate or equivalent high-grade engineering plastic with one window made of UV stabilized, silicon coated polycarbonate or equivalent high-grade engineering plastic for reading the register. The window shall be an integral part of the meter cover such that it cannot be removed undamaged without breaking the meter cover.

#### 1.36.4 Terminals and Terminals block:

- The terminal block shall be made of unbreakable, high grade non-flammable polycarbonate or equivalent high grade and good quality engineering plastic. The terminal block should have terminal holes and shall be of sufficient size to accommodate the conductors, meeting the requirement of IS 16444
- The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.
- Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.
- The meter shall be provided with terminal to connect the cables. The screws shall not have pointed edge at the end of thread. The clearance and creep age distance of terminal block and tips between the terminal and the surrounding parts of metal enclosure shall be as per IS16444 standard.

#### 1.36.5 Terminal Cover & Connection diagram:

The meter terminal block shall be provided with an extended terminal cover with independent sealing arrangement in such a way that it shall cover the terminals, the conductor fixing screws and their insulation.

The connection diagram of the meter shall be clearly shown on terminal cover and should be permanent in nature.

#### 1.36.6 Name Plate Marking: (as per IS)

The name plate should be as per IS and shall have following markings which shall be indelible, distinct and readable from outside the meter: —

- Manufacturer's name and/or trademark and the place (with country) of manufacture;
- Designation of type;
- The no. of phases and no. of wires for which the meter is suitable for;
- The manufacturer's serial number and year of manufacture;
- Reference voltage;
- The basic current and the maximum current;

- The principal unit in which the meter reads;
- Meter constant;
- Accuracy Class;
- Reference Frequency;
- Standard and BIS marking

**1.37 Load Survey Parameters**

The array of data to be retained inside the meter memory shall be for the **minimum 45** days for a capture period of 30 minutes for maximum 10 configured parameters. The load survey data shall be first in first out basis (FIFO). Load survey data shall be logged on non-time based basis, i.e. if there is no power for more than 24 hours, the day shall not be recorded. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. The load survey data can be retrieved as and when desired and load profiles shall be viewed graphically / analytically with the help of meter application software. The meter application software shall be capable of exporting / transmitting these data for analysis to other user software in spreadsheet format. The load survey parameters are as below.

<b>1.</b>	Real Time Clock – Date and Time
<b>2.</b>	Current – IR
<b>3.</b>	Current – IY
<b>4.</b>	Current – IB
<b>5.</b>	Voltage – VRN
<b>6.</b>	Voltage – VYN
<b>7.</b>	Voltage – VBN
<b>8.</b>	Block Energy – kWh
<b>9.</b>	Block Energy – kVAh – lag
<b>10.</b>	Block Energy – kVAh – lead
<b>11.</b>	Block Energy – kVAh
<b>12.</b>	Real Time Clock – Date and Time

**1.38 Tamper and Fraud Protection:**

The meter shall record events under the following tamper conditions:

- 1.38.1 Phase Sequence Reversal: The meter should work accurately irrespective of phase sequence of the supply.

- 1.38.2 Current Reversal: The meter shall be capable of detecting and recording occurrence and restoration with date and time if the current is flowing in reverse direction in one or more phases.
- The meter shall continue to record in forwarded direction in case of CT reversal
- 1.38.3 Terminal Shorting / Current Bypass: The meter shall have capability to record bypassing/shorting and opening of current coil (s) of one or any two phases with date, time.
- 1.38.4 Magnet influence: The meter shall comply with the accuracy under magnet influences as per IS-13779. There should be provision for defrauded registration ( $V_{actual} \times I_{max} \times \text{unity p.f.}$ )
- 1.38.5 Spark Influence: The meter accuracy shall not be affected on application of 35 kV spark. The accuracy of the meter shall be verified before & after the application of Spark device.
- 1.38.6 Meter Cover Open detection: Meter shall log the event with date and time in meter memory in case of meter cover open under mains on and off condition.
- 1.38.7 Neutral Disturbance: Meter should log the event of neutral disturbance in case influence through injection of spurious signal in neutral terminal and should perform deficiency metering ( $V_{ref} \times I_{actual} \times \text{unity p.f.}$ ).
- 1.38.8 Voltage Unbalance: Meter should log the event of voltage unbalance.

### **1.39 Minimum Testing Facilities:**

The manufacturer shall have facilities of conducting acceptance testing as per IS16444 Part1

### **1.40 Tests**

The test reports/certificate/records for all type tests specified having been successfully performed on the type of the meter offered shall be submitted with the tender. The bidder shall clearly bring out the deviations from this specification clause by clause whether on account of tests or manufacturing process or features incorporated in the meter. The tender lacking with above information and without supporting test reports for meter meeting the requirement of tests laid in this specification are likely to be rejected.

#### d) Type Tests

The Energy meter offered shall be fully type tested at any accredited test laboratory as per IS 16444 but test reports and shall not be more than 3 years old. The bidder shall furnish type test reports along with the bid.

#### e) Acceptance Test

All acceptance tests as stipulated in the relevant standards shall be carried out by the supplier in the presence of the purchaser's representative.

#### f) Routine Tests

All routine tests as stipulated in the relevant standards shall be carried out and routine test-certificates/reports shall be submitted to the purchaser for approval and also placed inside individual meter packing.

## **2. Prepayment System Requirement**

This section specifies the system requirements for Prepaid metering solution.

**2.1** Prepayment system shall have following provision-

1. Consumer definition
2. Tariff definition
3. Vend token generation
4. Remote token transfer for tariff and recharge
5. Remote connection/ disconnection
6. Debt Management

**2.2** The manufacture should share the standard interface document to utility for web service integration with utility B2B system for customer definition and third-party integration.

**2.3** The vending system shall use an internationally recognized encryption standard. The code shall be meter specific and can't be in used in any other meter.

**2.4** The bidder shall provide browser based vending system for token generation for each vending station however utility will provide connectivity i.e. VPN, internet for access between the vending station placed at utility premises & the bidder's backend server. Adequate back up power in the form of suitable UPS with standard back up will be ensured by Utility. The required IT infrastructure for vending system will be provided by Utility.

**2.5** The vendor shall provide Mobile App for purchasing vending tokens by the consumer. Utility will provide the details of payment gateway used by them and facilitate integration with mobile app. The integration charges if any for specific payment gateway will be borne by Utility.

**2.6** The bidder shall have contract agreement with Utility covering system deliverables, integration requirement, role and responsibility before commencement of system deployment to ensure the smooth rollover and operation.

## **3. Web Based Prepaid Application**

3.1.1 The bidder shall develop web based prepaid application and authorized access shall be provided.

3.1.2 Web based prepaid application should be developed in any platform such as Java, .Net etc.

3.1.3 This application should be scalable, and performance of application shall not decrease with increasing number of users.

3.1.4 Provision for permanent disconnection of prepaid consumer.

3.1.5 Web based prepaid application should support following functionalities:

3.1.5.1 Login

There should provision to login into prepaid application. Separate login should be provided for consumer management, point of sale management, and utility field offices. Also, there should be login with administrator role.

3.1.5.2 Configuration of consumer

After installation of prepaid meters, provision shall be given through mobile app for configuring the consumer and meter details into the web based prepaid application.

3.1.5.3 New Consumer Registration

Newly added consumers will be registered on utility New Connection (NC) system. Based upon the integration of web based prepaid system with utility system, the newly registered consumer's data shall be updated in the prepaid application database.

#### 3.1.5.4 Meter assignment and replacement

If meter of consumer is replaced in the field, then same shall be updated in prepaid application. Also, if any connection type of consumer is changed from postpaid to prepaid, there shall be provision to assign new prepaid meter for such consumers.

#### 3.1.5.5 Tariff/Consumer Category Change

If tariff of consumer is changed, same shall be updated in prepaid application. The changes made in the tariff of consumer should be updated through token.

#### 3.1.5.6 Recharge Facility

A consumer should recharge his account through cash/cheque/Net banking/Credit Card/Debit Card/E-wallets etc. as facilitated by utility. The balance available for that consumer will be updated in meter accordingly after recharge is made. The bidder shall provide consumer mobile app to recharge the meter using the online payment gateways like Paytm, etc. enabling 24X7 vending. There shall be provision for third party integration for the vend token generation for any time anywhere vending facility to the consumers.

#### 3.1.5.7 Display of Consumer

Consumer should be able to view history of recharges, meter balance information, consumption pattern, connected load, etc. made from time to time on the mobile app.

#### 3.1.5.8 Tariff Structure

The web based prepaid application shall be programmable for tariff structure, tax/, duty, tariff slabs etc. There should be facility to define tariff structure for consumers. Also, there should be provision to update tariff structure as per DISOCM requirements. The tariff structure should include following parameters.

- a) Fixed Charges
- b) Energy Charges
- c) Electricity Duty
- d) Taxes
- e) Meter Rent
- f) Debt Management
- g) Emergency Credit
- h) Friendly Credit Hours and Days

#### 3.1.5.9 Reports

Prepaid application should generate reports like sales, transactions, settlement, consumer summary, meter report, etc. The reports should be exported in text/excel and PDF formats. System shall have provision to generate following report -

- a. Sales transaction report
- b. Refund money report
- c. Retain credit report
- d. Debt payment report

### 3.1.5.10 Data Export

There should be provision of exporting the meter data of complete installed base meters in the agreed csv format. The data export shall be available for billing data, daily midnight data on regular interval and Load survey data as and when required.

### 3.1.5.11 Accounting statement

The application should support the facility of remote data reading of billing data for the meter's communication to HES. It should support the generating of accounting statement for the consumer database using the meter data.

## **Guaranteed Technical Specification for Three Phase Smart Prepay Meters**

<b>S. No.</b>	<b>Description</b>	<b>Requirement</b>	<b>Offered</b>
1.	Type of the meter	Three phase four wire, smart prepayment meter-direct reading type without application of any multiplication constant	
2.	Standard compliance	IS 16444, IS 15884, IS 13779	
3.	Accuracy Class	1.0	
4.	Basic Current (Ib) & rated Maximum current (Imax)	Ib= 10A; Imax= 100 Amps	
5.	Operating Voltage	Meter shall be operational with required accuracy from 0.7 Vref to 1.3 Vref for ref. voltage of 240 V.	
6.	Operating Frequency	50 Hz± 5%.	
7.	Power Consumption	Voltage & current circuit: As per IS16444 standard.	
8.	Starting Current	As per IS16444	
9.	Connect disconnect switch compliance	UC1 or higher due to load switching capability as per IS 15884	
10.	Communication	Optical port – IEC 1107 Bi-directional remote comms – NBIoT cellular comms (fallback to GPRS)	
11.	Consumer interface option	Mobile App (optional)	
12.	Terminals withstand capability	120% of Imax for 2 Hrs	
13.	Resistance to heat and fire	As Per relevant IS standard	
14.	Connection Diagram	The connection diagram shall be provided on terminal cover and should be permanent in nature	
15.	Internal diameter of the terminal holes	Min 8.0 mm	
16.	Clearance between adjacent terminals	As per IS 15884	
17.	Display	LCD display with minimum six digit	
18.	Keypad	Meter shall have capacitive touch type keypad functionality	
19.	Metrology LED	Two LED support for accuracy testing for active	

		and reactive energy	
20.	Ingress Protection	IP54 or better	
21.	Break to open functionality	Physical evidence on forcibly opening of case/cover along with cover open detection event	
22.	Prepayment functionality	As specified in relevant clause	
23.	Display parameter support	As specified in relevant clause	
24.	Display interface	Keypad	
25.	Tamper & fraud protection	As specified in relevant clause	
26.	The system shall comply with cybersecurity standards, which focuses on Privacy Information Management Systems (PIMS) to ensure the protection of Personally Identifiable Information (PII).	As per ISO/IEC 27701	
27.	Certification from IT & Cyber security division of Ministry of Power	MTCTE Certification required	

## **Technical Specifications of Pilfer Proof Meter Box to House Single Phase Smart Prepay Energy Meter**

### **1. Scope**

The meter box will be intended to house one number single-phase electronic smart prepayment energy meter. The meter box complies with IS: 14772 with latest amendment

### **2. Material**

The meter box will be made of transparent polycarbonate material which complies following properties:

- Meter box will be weather proof
- Capable to withstanding temperatures of boiling water for 5 minutes as per IS 2046
- It will withstand Glow wire test at 650°C.
- HDT of Polycarbonate material will be minimum 120° C ± 5° C (at 1.8 MPa ).

### **3. Construction**

- 3.1 The meter Box will have provision for easy flow of rainwater with better IP protection.
- 3.2 The average thickness of the box will be minimum 2.0 ± 0.2mm on all sides.
- 3.3 The overall dimensions of the box will be such that a minimum 15 mm clearance from left, right side and top, 10 mm from front and back side, 75 mm from the live terminals of meter will be maintain in between meter and box surface with general tolerance of ± 2 mm.

- 3.4 Box cover should be push fit type.
- 3.5 Meter Box would comply with IP 54.
- 3.6 Suitable arrangement will be required on the cover of the box to operate the meter actuators/ push buttons for display access and using associated meter functionalities.
- 3.7 Meter box shall have the provision to read the meter through optical port, such arrangement shall have the sealing arrangement.
- 3.8 Colour:  
The front cover and base of meter box would be made of transparent Polycarbonate material.
- 3.9 Box Mounting:  
Box will have 3 nos. holes of minimum  $6\pm 1$  mm diameter for fixing the meter box on concrete wall / wooden board. Upper side hole shall have key type arrangement.
- 3.10 Cable Entry:  
Suitable provision would be available at the bottom side of the meter box for cable inlet & outlet and the same will be capable of accommodating cable size up to 20 mm diameter, two nos. engineering plastic cable gland will be provided for cable incoming & outgoing
- 3.11 Marking:
  - Following information shall be made available on the cover of meter Box:
    - a. Manufacturer information (logo/name)
    - b. Danger sign will be engraved/ embossed on the front cover of meter box
  - Name plate details of meter should be readable from outside of meter box.

#### 4. Tests for Box

The following tests are to be conducted on the box at any independent NABL accredited laboratory and test reports will be carried out as per IS 14772 or other similar applicable related standard, it shall be carried out within 3 years from the tender opening date.

- 4.1 Test of HDT minimum  $120\pm 5^\circ$  C (at 1.8 MPa),
- 4.2 Test for mechanical strength
- 4.3 Glow wire test at  $650^\circ$ C as per IS: 11000
- 4.4 Material Identification test

#### 5. Acceptance Test

- 5.1 Physical verification of dimensions of the box.
- 5.2 Compatibility of the box for housing the single phase smart prepay meter, and ensuring ease of display access, optical port access for reading of meter.

#### 6. Routine Test

The routine test certificates for the following will be furnished for approval of the purchaser.

- 6.1 Physical verification of dimensions of the box.
- 6.2 Compatibility of the box for housing the single phase smart prepay meter, and ensuring ease of display access, optical port access for reading of meter.

### Guaranteed Technical Particulars for Single Phase Smart Prepay Meter Box

S. No.	Characteristics	Bidders particulars
1.	Manufacture's Name	
2.	Material used for box body:	

	(Transparent Polycarbonate FR)	
3.	Colour of box for (a) base and (b) cover : Transparent	
4.	Dimension of box (H X W X D) in mm (Within 400 mm x 250 mm x 150 mm)	
5.	Clarence from meter surface a) Left, Right & Top side : 15mm b) Bottom (from terminals) : 75mm c) Front & back : 10mm ( General tolerance $\pm 2$ mm)	
6.	Thickness of Meter Box Average 2 mm from all sides ( $\pm 0.2$ mm.)	
7.	Display access arrangement at cover of the box	
8.	Optical port access arrangement for meter reading	
9.	Sealing arrangement on Box : Minimum 2 Nos.	
10.	Material withstanding temperature: a) Boiling water test : As per IS 2046 b) Glow wire test at 650deg. C	
11.	Inlet & Outlet Glands : Engineering Plastic Gland	
12.	Suitable for outdoor installation IP class : IP 54	
13.	Inlet & Outlets with Engineering plastic Glands	
14.	Meter mounting Arrangement a) Upper Side : 1 No. Key Type hole 6 mm $\pm$ 1mm b) Lower side : 2 Nos. Round hole 6 mm $\pm$ 1mm	

**Note:** The meter box size should be bare minimum so that meter can be installed in small spaces particularly in multistoried buildings and commercial shops and complexes.

### **Technical Specifications of Pilfer Proof Meter Box to House Three Phase Smart Prepay Energy Meter**

#### **1. Scope**

The meter box will be intended to house one number single-phase electronic smart prepayment energy meter. The meter box complies with IS: 14772 with latest amendment

## **2. Material**

The meter box will be made of transparent polycarbonate material which complies following properties:

- Meter box will be weather proof
- Capable to withstanding temperatures of boiling water for 5 minutes as per IS 2046
- It will withstand Glow wire test at 650°C.
- HDT of Polycarbonate material will be minimum  $120^{\circ} \text{C} \pm 5^{\circ} \text{C}$  (at 1.8 MPa ).

## **3. Construction**

- 3.1 The meter Box will have provision for easy flow of rainwater with better IP protection.
- 3.2 The average thickness of the box will be minimum  $2.0 \pm 0.2\text{mm}$  on all sides.
- 3.3 The overall dimensions of the box will be such that a minimum 15 mm clearance from left, right side and top, 10 mm from front and back side, 75 mm from the live terminals of meter will be maintain in between meter and box surface with general tolerance of  $\pm 2$  mm.
- 3.4 Box cover should be push fit type.
- 3.5 Meter Box would comply with IP 54.
- 3.6 Suitable arrangement will be required on the cover of the box to operate the meter actuators/ push buttons for display access and using associated meter functionalities.
- 3.7 Meter box shall have the provision to read the meter through optical port, such arrangement shall have the sealing arrangement.
- 3.8 Colour:

The front cover and base of meter box would be made of transparent Polycarbonate material.

### 3.9 Box Mounting:

Box will have 3 nos. holes of minimum  $6 \pm 1$  mm diameter for fixing the meter box on concrete wall / wooden board. Upper side hole shall have key type arrangement.

### 3.10 Cable Entry:

Suitable provision would be available at the bottom side of the meter box for cable inlet & outlet and the same will be capable of accommodating cable size up to 25 mm diameter, two nos. engineering plastic cable gland will be provided for cable incoming & outgoing

### 3.11 Marking:

- Following information shall be made available on the cover of meter Box:
  - c. Manufacturer information (logo/name)
  - d. Danger sign will be engraved/ embossed on the front cover of meter box
- Name plate details of meter should be readable from outside of meter box.

## **4. Tests for Box**

The following tests are to be conducted on the box at any independent NABL accredited laboratory and test reports will be carried out as per IS 14772 or other similar applicable related standard, it shall be carried out within 3 years from the tender opening date.

- 4.1 Test of HDT minimum  $120 \pm 5^{\circ} \text{C}$  (at 1.8 MPa),
- 4.2 Test for mechanical strength
- 4.3 Glow wire test at 650°C as per IS: 11000

4.4 Material Identification test

**5. Acceptance Test**

5.1 Physical verification of dimensions of the box.

5.2 Compatibility of the box for housing the single phase smart prepay meter, and ensuring ease of display access, optical port access for reading of meter.

**6. Routine Test**

The routine test certificates for the following will be furnished for approval of the purchaser.

6.1 Physical verification of dimensions of the box.

6.2 Compatibility of the box for housing the single phase smart prepay meter, and ensuring ease of display access, optical port access for reading of meter.

**Guaranteed Technical Particulars for Three Phase Smart Prepay Meter Box**

S. No.	Characteristics	Bidders particulars
1.	Manufacture's Name	
2.	Material used for box body: (Transparent Polycarbonate FR)	
3.	Colour of box for (a) base and (b) cover : Transparent	
4.	Dimension of box (H X W X D) in mm. (Within 450 mm. X 300 mm. X 150 mm.)	
5.	Clarence from meter surface a) Left, Right & Top side : 15 mm. b) Bottom (from terminals) : 75 mm. c) Front & back : 10 mm. ( General tolerance $\pm$ 2 mm)	
6.	Thickness of Meter Box Average 2 mm from all sides ( $\pm$ 0.2 mm)	
7.	Display access arrangement at cover of the box	
8.	Optical port access arrangement for meter reading	
9.	Sealing arrangement on Box : Minimum 2 Nos.	
10.	Material withstanding temperature: a) Boiling water test : As per IS 2046 b) Glow wire test at 650deg. C	
11.	Inlet & Outlet Glands : Engineering Plastic Gland	

12.	Suitable for outdoor installation IP class : IP 54	
13.	Inlet & Outlets with Engineering plastic Glands	
14.	Meter mounting Arrangement c) Upper Side : 1 No. Key Type hole 6 mm. ± 1 mm. d) Lower side : 2 Nos. Round hole 6 mm. ± 1 mm.	

**Note:** The meter box size should be bare minimum so that meter can be installed in small spaces particularly in multistoried buildings and commercial shops and complexes.

#### **4. Prepayment System Requirement**

This section specifies the system requirements for Prepaid metering solution.

**4.1** Prepayment system shall have following provision-

7. Consumer definition
8. Tariff definition
9. Vend token generation
10. Debt Management

**4.2** The manufacture should share the standard interface document to utility for web service integration with utility B2B system for customer definition and third-party integration.

**4.3** The vending system shall use an internationally recognized encryption standard. The code shall be meter specific and can't be in used in any other meter.

**4.4** The bidder shall provide browser based vending system for token generation for each vending station however utility will provide connectivity i.e. VPN, internet for access between the vending station placed at utility premises & the bidder's backend server. Adequate back up power in the form of suitable UPS with standard back up will be ensured by Utility. The required IT infrastructure for vending system will be provided by Utility.

**4.5** The vendor shall provide Mobile App for purchasing vending tokens by the consumer. Utility will provide the details of payment gateway used by them and facilitate integration with mobile app. The integration charges if any for specific payment gateway will be borne by Utility.

**4.6** The bidder shall have contract agreement with Utility covering system deliverables, integration requirement, role and responsibility before commencement of system deployment to ensure the smooth rollover and operation.

Contractor with Seal and Signature

Executive Engineer (Electrical)  
Deendayal Port Authority