Maharashtra State Electricity Distibution Co. Ltd.

Tender Details 13-08-2022 04:04:39	
Tender Code	MMD/T-NSC-02/0622 VERSION- 4
Tender Type	Works Tender
Type Of Bid	Two Bid
Description	Tender for Appointment of Advanced Metering Infrastructure Service Provider (AMISP) for Smart Metering on Design-Build-Finance-Own-Operate-Transfer (DBFOOT) basis on Totex mode
Estimated Cost (In Lakhs)	
Basis of prices	NA
Tender Validity	NA
Delivery Requirement (In Months)	NA
Tender on rate contract basis	NO
Tender Fee (In INR)	25000
GST In INR (@18% on Tender Fee: SAC No.	4500
Total Tender Fee Amount including GST in INR.	29500
Contact	Mr Girish Gaikwad , 7506990821 ,cemmcmsedcl@gmail.com
Pre-Qualifying Req	As per QR Clause of RFP
Budget Type	NA
Scheme Code	null
Scheme Name	
Department	Material Management Cell
Office Type	HO
Location Type	Corporate Office
Designation	Executive Engineer(Distribution)
Pre-Bid Meeting Address	CHIEF ENGINEER, Maharashtra State Electricity Distribution Co. Ltd., Material Management Dept., Plot No. G-9, “Prakashgad” First floor, Prof. Anant Kanekar Marg, Bandra (E), Mumbai – 400 051. E-mail: cemmcmsedcl@gmail.com
Bid Opening Address	CHIEF ENGINEER, Maharashtra State Electricity Distribution Co. Ltd., Material Management Dept., Plot No. G-9, “Prakashgad” First floor, Prof. Anant Kanekar Marg, Bandra (E), Mumbai – 400 051. E-mail: cemmcmsedcl@gmail.com
Version No	4
Call for Deviation	NO
Is Annexure C1 Applicable	NA
Is Manufacturer Applicable	NO
Is Trader Applicable	NO

Minimum % of Offered Quantity	NA
Is Power Supplier Applicable	NO
Tender Sale Start Date	21-06-2022 20:30
Tender Sale End Date	23-08-2022 12:00
Bid Start Date	21-06-2022 20:35
Bid End Date	23-08-2022 15:00
Pre-Bid Meeting Date	30-06-2022 17:00
Techno-Commercial Bid opening on	23-08-2022 15:30
Price Bid opening on	Will be declared later
Annexure C1 Opening Date	NA
Winner Selection Date	Will be declared later

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION CO. LTD.

Request for Proposal

Tender for Appointment of Advanced Metering Infrastructure Service Provider (AMISP) for Smart Metering on Design-Build-Finance-Own-Operate-Transfer (DBFOOT) basis on Totex mode

Tender No: MMD/T-NSC-02/0622

CHIEF ENGINEER,
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1.0 INTRODUCTION

1.1 Overview:

Maharashtra State Electricity Distribution Company Ltd (MSEDCL) has its operations in the North East area of Mumbai and rest of Maharashtra State with a customer base of around 2.80 Crore. MSEDCL expends substantial effort and resources in realizing its mission of 'Ensuring Excellence in Customer Services".

1.2 Objective:

Approximately 12.80 lakhs smart single phase, three phase, DT Meter, HT Meter and Feeder meter are covered in project. These meters are required for replacement of electro-mechanical, plain static, IR port, RF meters and old meters. Some of these are read manually by photo meter reading while some are read through HHT throughout the month. MSEDCL has taken a decision to read all single phase, three phase, DT Meter, HT Meter and Feeder meters through AMR. Hence, it is necessary to replace the existing meters with AMR compliant smart meters (Prepaid/Postpaid) such that these meters shall be read through AMR/AMI.

The main objective is to supply and installation of Smart Energy Meters (Prepaid/Postpaid) as per IS:16444-2015 or IEC:62052/62053 & as per MSEDCL's technical specifications along with communication module and FMS activity viz. establishment and maintenance of communication between meter and server, Application Server, Communication (Data + SMS), pre-paid metering solutions & Training etc. The Smart meter data using communication module shall be transported to HES.

As per the scope of consumers to be covered, the storage of material required for project will be in the scope of bidder.

These meters are to be installed by replacement at existing residential, commercial, industrial and other category consumers in MSEDCL. Meter data of these meters to be acquire automatically from the remote for contractual period avoiding any manual intervention, monitor important distribution parameters, use of meter data for accurate billing purposes and generate exceptions and MIS reports for proper planning, monitoring, decision support and taking corrective actions on the business activities by Management.

The above objective is achieved by providing an automatic meter reading (AMR) based data logging of Energy Meters.

1.3 Intent of the Project:

MSEDCL intends to appoint a "Advance Metering Infrastructure Service Provider (AMISP)" project in the pre-paid / post-paid mode in selected areas of operation. The scope of work of the AMISP shall cover end to end consumer metering in the AMI Project area to enable complete energy accounting with zero manual intervention.

The AMI Project shall include:

a) Deployment of Smart Meters, communication systems, Head End System (HES) and Meter Data Management system (MDM).
b) Integration with billing systems, and existing legacy systems.
c) Development of standard interfaces to enable integration of future IT/ OT applications with the AMI system.

The AMISP shall also be responsible for its operations of all meters and related infrastructure after Operational Go-Live of the AMI system. Utility shall pay AMISP Service Charge on monthly basis to AMISP in accordance with the terms and conditions of the AMISP Contract. AMISP shall transfer the ownership of the entire system including all the hardware, software along with its valid licenses, and any data collected during the Project to the MSEDCL at the end of the Contract Period to facilitate seamless operation of MSEDCL's businesses.

2.0 QUALIFYING REQUIREMENTS:

Definition of Bidder:

The bidder can be Meter Manufacturer or System Integrator or Consortium of both.

A System Integrator is one who will deliver the AMISP's core deliverables such as MDM (Meter Data Management, HES (Head End System), NMS (Network Management System) and the Smart Meters.

The bidder should meet following Qualifying Requirement:

Sr. No.	Description	Remarks
A	**TECHNICAL REQUIREMENT**	
1	Bidder should have experience of Integration of MDAS/ head-end system with MDM for at least [50,000] consumers (cumulatively) (power sector) in the last 5 years from date of submission of bid which are in operation for at least 1 (one) year. OR Bidder should have Installed, integrated, tested and commissioned control centre hardware and application software for at least [50,000] Metering points (cumulatively) (power sector) in last 5 (five) years from date of submission of bid which are in operation for at least 1 (one) year.	In case of consortium requirement can be met collectively by consortium partners.
B	**FINANCIAL REQUIREMENT**	
1	The bidder shall have audited average annual turnover of Rs. 180 Crs. during last 3 financial years. i.e. 2018-19, 2019-20 & 2020-21 or 2019-20, 2020-21 & 2021-22.	In case of consortium requirement can be met collectively by consortium partners. The lead bidder should meet at least 51% of requirement and other member shall meet at least 25% of the requirement.
2	The Bidder shall have positive net worth for each of the last three financial years i.e. 2018-19, 2019-20 & 2020-21 or 2019-20, 2020-21 & 2021-22.	In case of consortium requirement have to be met by both the members.
C	**METER MANUFACTURER**	
1	Should have 5-year experience of supply and manufacturing of energy meters.	
2	Bidder should have supplied 25 Lakh static meters and 25,000 Nos. Smart meters as per IS:16444 or IEC:62052/62053 during last Five (5) financial years and 2022-23 as on date of tender opening.	
D	**SYSTEM INTEGRATOR**	
1	**Head End System (HES) solution provider**	
	The HES solution should have been successfully integrated with at least 2 (two) different MDMS/ other utility IT Solution in Indian/ Global Power Utility in last 5 (Five) years which are in operation for at least 1(one) year.	
2	**Meter Data Management System (MDMS) solution provider**	
	The proposed MDM solution should have been successfully integrated with at least 2 (two) nos. of different HES solutions & Billing Systems in Indian/ Global Power Utility in last 5 (Five) years which are in operation for at least 1 (one) year.	

Sr. No.	Description	Remarks
3	**Supply of Meters (in case System integrator is individual bidder)**	
	System Integrator should be able to supply Smart Meters from reputed manufacturers. The details of the Meter manufacturers (maximum 3 Nos) has to be mentioned in the bid.	

In addition, the bidder should fulfill following qualifying requirements:

I) The Bidder/ lead bidder (in case of consortium) must be a single entity having at least one permanent establishment of its own office in India, registered in India under companies Act 1956 or Companies Act 2013, or firm registered with Registrar of firms and societies in India who fulfills the eligibility criteria. The Bidder/members of consortium should not have been blacklisted by *any Ministry of GoI / GoM / state owned electricity distribution utility and still in force.*

II) The bidder / lead bidder (in case of a consortium) shall be registered on MSEDCL's e-tender website.

III) The bidder / lead bidder (in case of a consortium) shall be responsible for all the deliverables under the contract & shall have the authority to conduct all businesses for and on behalf of any and all the parties during the bidding process and, in the event the bidder is awarded the Contract, during contract execution.

IV) The bidder / lead bidder (in case of a consortium) shall be bound to MSEDCL for the fulfillment of all the provisions of the entire Contract, while the other member of consortium shall be jointly and severally responsible for their portion of work in accordance with the contract terms.

V) The Meter Manufacturer shall submit ISO 9001:2008 certifications or equivalent international standard certification and CMMI Level 3 (minimum) Certification along with bid.

VI) The Meter Manufacturer shall submit valid BIS License Certification and Type Test certificates as per technical specifications along with bid.

VII) The Meter Manufacturer must submit the following certifications along with bid:
a) The meter shall bear ISI mark as per IS:16444/2015 amended up to date.
b) ISO 9000 & ISO 14000 Certificates or IEC:62052/62053 certificate

VIII) The Meter Manufacturer should submit valid NABL accreditation Certification that they have in house National Accreditation Board for Testing and Calibration Laboratories (NABL) Lab for testing of Energy Meters or equivalent International accreditation certification.

IX) The Meter Manufacturer has to submit R&D certification from Department of Science and Industrial Research (DSIR) or equivalent International standard certification along with offer. However, those firms which are not having R&D certification but have applied for R&D Certification, they shall submit this certificate before opening of Commercial Bid (Price Bid) of subject tender. Non submission of Certification before opening of Commercial Bid (Price Bid) from bidders, their offer shall not be considered for further evaluation.

X) System Integrator should have all relevant certifications and experience as envisaged above.

Manufacturer's Authorization
(To be obtained from OEMs)

Date:
Tender No.:

To

WHEREAS _____

who are official manufacturer of_____ having factories at _____ do hereby authorize _____ to submit a Bid in relation to the Invitation for Bids indicated above, the purpose of which is to provide the following Goods, manufactured by us _____ contract and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with respect to the Goods offered by the above firm in reply to this Invitation for Bids. We also confirm that we are fully aware of the scope of work and have complete knowledge of the terms and conditions of the refereed tender.

Name _____

In the capacity of: _____

Signed _____

Duly authorized to sign the Authorization for and on behalf of _____

Date _____

3.0 SCOPE OF WORK

3.1 The scope of work of the AMISP shall cover end-to-end metering (from Feeders, Distribution Transformers (DTs) and all end consumers) in the selected AMI Project area to enable complete energy accounting with zero manual intervention. The AMI Project shall include:

a) Deployment of Smart Meters, communication infrastructure, Head End System (HES), Meter Data Management system (MDM) and integration of with existing IT systems;

b) Development of standard interfaces to enable integration of future IT/ OT applications with the AMI system.

c) The AMISP shall ensure the interoperability of the AMI system so that the AMI system is device agnostic and able to integrate any type of Smart meter which the utility desires to be part of the AMI system.

d) Meter Replacement details (Old meter reading final reading, new meter initial reading, date of meter replacement etc.) to be fed by bidder directly to Central Server using MSEDCL New Connection App; mobile app. Required access and training for using the app will be given to successful bidder.

e) The communication infrastructure shall be provided by AMISP based on the selected areas which ranges from densely populated areas to scattered areas. The decision of AMISP to select communication infrastructure for a particular area shall be based on the condition to meet the performance SLA defined for AMISP.

f) The AMI Project shall be transferred to the MSEDCL at no cost at the end of the term of the AMISP Contract on as-is where-is basis. The roles and responsibilities of the AMISP and payment thereof shall be governed by the terms and conditions of the AMISP Contract.

g) The details of project area is as under:

Name of Region	Name of Sub Divisions to be covered under scope of work	Approx. qty. of Smart Meters
Kokan	Nerul, Palm Beach and Washi	3,40,000
Pune	Kothrud, Deccan Gymkhana, Aundh and Kasba	3,20,000
Aurangabad	Aurangabad Power House, Chawani, Shahganj, Gharghed and Krantichowk	3,20,000
Nagpur	Kamtee Urban, MRS, Regent, Shankar Nagar and Trimurti Nagar	3,00,000
	Total	**12,80,000***
*The above quantity also includes region wise count of street lights, Govt. consumers, Public Water Works (PWW) and Hoardings.		

h) The release of New Service Connections (NSC) during contract period is in the scope of bidder.

i) In case of HT consumer having AMR availability the data of these meters are to be integrated with HES system of the Bidder.

3.2 Advanced Metering Infrastructure (AMI):

The bidder will be responsible for designing, building and operating AMI system in selected area. This AMI system will be integrated system of smart meters, communication networks and meter data management system that enables two way communication between server & smart meters. AMI system shall have following core components:

a. Smart meters
b. Communication infrastructure
c. Head End System (HES)
d. Meter Data Management System (MDM)
e. Network Management System (NMS)

Head End System (HES) & Meter Data Management System (MDM):

a. Bidder has to provide complete AMI solution including HES & MDM. This solution will be deployed on cloud arranged by bidder.. Cloud charges for instance including cost of all licenses required for OS, database, software tools etc. required for hosting of AMI solution for entire contract period, will be borne by the bidder..

b. HES & MDM should be scalable up to 100% of the meter quantity for region.

c. Bidder has to maintain HES & MDM during the FMS period.

3.3 Facility Management Services (FMS) Activities For Smart Meters / Communication connectivity scope:

i. It will be sole responsibility of bidder to ensure 24*7 connectivity between Smart (Post-paid / Prepaid) meter and central server.

ii. SIM Cards

iii. If cellular communication is proposed, SIM cards should be arranged by bidder. The cost of SIM card & recurring monthly charges shall be borne by the bidder The bidder should be responsible for choosing the service provider in given area and coordination with service provider.

iv. In case of non-communication due to SIM card issues, agency should resolve SIM issues after reporting to concerned service provider.

v. In case of non-communication due to issues of communication module in meter, agency has to replace such meters/ communication module (in case of pluggable communication module)

Supply and Installation of DCU if bidder proposed RF based communication

- The bidder has to complete the field survey and design the RF network using systematic approach. Agency has to do RF network planning using RF network planning and analysis tool, before installation of RF DCU in the field, to improve network performance and reliability. At DCU install point, reception of signal should be maximum, affirming the requirements of the specification
- The bidder should hand over the list of DCU install points to concerned MSEDCL sub-division office.
- DCU should be mounted on wall or distribution poles, or on separate supporting structure based on the requirement. Pole mounting/wall mounting is to be done with proper galvanized iron flats/strip to pole designed for weight of DCU. It is to be locked and protected for secured access of the O&M staff of MSEDCL. DCU must be protected against ingress of water/moisture/dust/insect. Any damage or discrepancies to the DCU and its components such as sensors, displays, alarm systems, etc. have to be replaced by the agency.
- It will be the responsibility of the bidder to choose the DCU install point after due survey for optimal network. If required, bidder may install DCUs on separate structures of their own. MSEDCL will facilitate for power supply arrangements for DCU install points.

i. In case of communication failure between Smart (Post-paid/Prepaid) meter and central server bidder has to resolve issue within 72 hours & establish communication between meter & server. Also bidder shall make alternate arrangements to download the Smart meter data through optical port, at its own cost. In such cases the bidder should read the meter data through optical port and the downloaded data should be uploaded to prepaid application. No payment shall be made by MSEDCL for meters downloaded through optical port. Any failure to meet this requirement shall attract penalty as per SLA with bidder for maintenance & support during warranty and FMS periods.

ii. The bidder should facilitate the signing of SLA and agreement between bidder and MSEDCL.

iii. The bidder shall ensure and commit its SLA for maintenance and support during warrantee and FMS periods of contract.

3.4 Communication Infrastructure

1. Communication infrastructure should either be based on RF / RF Mesh network / Power Line Carrier Communication (PLCC) / LoRa/Fiber Optic / Cellular communication technology or a combination of any of these technologies.
2. Communication network shall provide reliable medium for two-way communication between various nodes (Smart Meter, Gateway/Router/Access Point/ DCU (wherever applicable)) & HES.
3. RF based network should use unlicensed frequency band as permitted by WPC. The engagement of network service provider is in the scope of the bidder to meet the performance level.
4. Meter data shall be routed/collected by field devices like Gateway/Router/Access Point, Data Concentrator Units (DCUs) wherever applicable given the communication technology used and transported to HES through WAN backhaul connectivity.

3.04.01 General Requirements

1. The bidder shall design/hire reliable, interference free & robust communication network. It shall be effective for providing communication in terrain, topology & the consumer density of the project site.
2. Before designing the communication network, the bidder shall do the site survey and would provide the most efficient communication infrastructure.
3. The entire infrastructure & associated civil works required for installation & commissioning of equipment/devices such as DCUs, repeaters, routers & access points etc. shall be in the scope of the bidder.
4. The network Solution deployed by the bidder should have disaster recovery mechanism in place.
5. The quality of installation of the various equipment & power supply wiring to all field equipment shall be as per standards/ regulations/prevailing practices of the utility. The reasonable supply of electricity needed for operation and maintenance of entire AMI system shall be the provided by the utility free of cost.
6. A suitable NMS shall be built to monitor the performance of the communication network round the clock. The NMS shall provide viewing of all the networking elements deployed at site and enable configuration & parameterization of the networking devices and the nodes.

3.04.02 Network Security

The Network shall have adequate cyber security measures not limited to the measures as described below. The network security would be extended to all the interfaces also. The security may leverage the following:

a) Secure Access Controls
b) Authorization Controls
c) Logging
d) Hardening
e) Malicious Software Prevention
f) Network Security
g) Device Security

3.04.03 Communication Network Elements

Following sections provide detail on both DCU based communication network and router-based RF mesh network.

The bidder shall select relevant parts as applicable for designing and establishing communication infrastructure. The network, shall be horizontally and vertically scalable to accommodate future meter installations. The network elements may be comprised of the following.

(A) DATA CONCENTRATOR UNIT (DCU) (Applicable in case of RF based communication)

i. The Data Concentrator Unit is a gateway for communication of data between the Smart Meters and the HES. The Data Concentrator Unit receives information from the Smart Meter on a scheduled / need basis and stores the data, which can be accessed by HES for onward transfer to Server

ii. The DCU provides the central link between Smart Meters and HES, enabling continuous/periodic meter read and control. DCU shall exchange data from smart meters on RF and with HES on WAN.

iii. Enclosure/box of DCU shall be minimum IP55 or better compliant. A suitable mounting arrangement required for DCU installation shall also be provided.

iv. A suitable and optimum power supply shall be provided keeping in view that even in case of outage in one or two phases, DCU can be powered. DCU should be capable of withstanding surges & voltage spikes of 6KV as per IEC 61000-4-5 standards. Power supply shall be terminated on suitable sized MCB to facilitate isolation during on-site maintenance.

v. DCU shall have battery with backup for 1 hour for normal meter reading, to push tamper event, carry out on demand reading and the network health status / connectivity continuity & check. DCU should have the suitable feature to send power outage and restoration message to the HES. The battery shall have a guaranteed life of 10 years.

vi. DCU shall have built in Real Time Clock (RTC) with separate battery backup. The battery shall have a guaranteed life of 10 years. It shall have self-diagnostic feature for RTC, memory, battery, communication module, etc. Alternatively, Software driven RTC may also be used as per agreement between supplier and MSEDCL.

vii. DCU shall have following configuration functionalities:

1. It shall be able to configure the communication with underlying nodes/meters.
2. It shall pull data from the field devices and push the data at configured intervals to the HES. It should also support the HES in pulling data from the field devises/meters. The data acquisition (Push/Pull) frequency shall be programmable. DCU shall be capable to prioritize control commands.
3. DCU shall ensure a secure communication to HES and shall have internal memory for storing interval data for at least 5 days.
4. DCU shall support on demand read and ping of individual/group of meters.
5. DCU shall push events like tamper, power off etc. to HES immediately on occurrence/receipt from field devices/meters.
6. The equipment shall be weatherproof, dustproof and constructed for outdoor installation on poles (minimum rating: IP-55). A suitable mounting provision shall be made for the equipment.
7. Enclosure: Provision for security sealing shall be provided and in case the gasket of the cover is used for protection against moisture, dust and insects, the gasket shall be made of weather and aging resistant material.
8. The list of standards followed in all the devices/equipment used in communication network shall be furnished

viii. **DCU Communication:**

1. The communication architecture shall be any, as defined under IS 16444.
2. The DCU shall ensure the appropriate backhaul for secure transfer of data to HES. In case of cellular communication, backhaul should be 4G with facility to fall back on 2G, in case of non-availability of 4G networks. The backhaul shall support SIM card from any service provider. It shall have Wide Area Network (WAN) connectivity to the HES through suitable means.
3. DCU shall be able to communicate with meters RF mesh (license free band)
4. DCU shall periodically monitor meter reads/downstream commands and shall retry and reconnect in case of failed events/reads.
5. It shall push events like tamper, power off etc. to HES immediately on occurrence/receipt from field devices/meters. DCU shall be able to acquire and send data to HES for full capacity (as per designed for no. of meters/field devices) to ensure the performance level. Full capacity of DCU is required to be indicated in the offer.
6. After Power Interruption, on restoration of power supply, DCU shall establish communication with underlying devices as well as upstream application automatically.
7. DCU shall be able to communicate with the nearest meters depending on topographical features. For further communication among the meters, distance of the other meters with the DCU shall not be a constraint as communication of the nearest meters shall be established with other meters through appropriate mesh formation / other formation.

8. Remote Firmware Upgrade: The DCU shall support remote firmware upgrades as well as remote configuration from HES. Configuration of programmable parameters of smart meters shall be done through HES.
9. All meters falling under one DCU shall be commissioned and checked for proper communication in presence of utility in-charge.
10. DCU shall keep the records of minimum of the following events:
    - No of packet failures
    - Retry attempts
    - Missed periodic readings
    - Failure to connect
    - Tamper events

ix. Testing of the DCU:

a. DCU shall be tested for the following:
b. Radio interference measurement (CIS PR 22)
c. Surge test (IEC 610004-5)
d. Fast transient burst test (IEC 61000-4-4)
e. Test of immunity to electrostatic discharges (IEC 61000-4-2)
f. Test of immunity to electromagnetic HF field (IEC 61000-4-3)
g. Resistance to heat and fire
h. The bidder shall provide IP-55 compliance test certificate for DCU.

(B) Gateway/ Router/ Access Point based RF Mesh Network

In this type of communication network, different network nodes including end points (Smart Meters) shall interconnect with each other using RF mesh network and they shall communicate with nearby gateways/ routers to transfer the data to access points. If any gateways/ routers/ repeaters/ access points fail, then nodes connected on that device shall automatically reconfigure the mesh with available nearby nodes.

i. **General Requirement of RF Mesh Network:**

a) The communication network shall have dynamic & self-healing capability. If one of the communication elements such as gateways/ routers/ access points fails, then nodes connecting to that element shall switch to best available element for communication of data to HES.
b) It shall support IPv6 network addressing.
c) Each node shall keep a track of best available nearby nodes or access points.
d) The communication network equipment shall use Unlicensed or Licensed frequency band as permitted by WPC/Statutory Bodies as applicable.
e) All the communication network equipment shall be as per WPC guidelines, Government of India for operation in licensed / license free frequency band.
f) Suitable NMS shall be available to monitor the performance of the communication network round the clock. The NMS shall provide viewing of all the networking elements deployed at site and enable configuration, parameterization of the networking devices and the nodes.
g) It shall support remote firmware upgrading
h) It shall be secure enough to avoid all cyber threats
i) The communication network shall ensure secure communication of data to HES.
j) The equipment shall be weatherproof, dustproof and constructed for outdoor installation on poles (minimum rating: IP65). A suitable mounting provision shall be made for the equipment.
k) The list of standards followed in all the devices/equipment used in communication network shall be furnished.

ii. **Configuration, Functionality & Interface**

Access points shall have following configuration functionalities:

a) It shall be able to configure the communication with underlying nodes/end points.
b) It shall support on demand read and ping of individual/group of meters.
c) It shall push events such as tamper, power off etc. to HES immediately on occurrence/receipt from field devices/meters.
d) It shall have Wide Area Network (WAN) connectivity to the HES through suitable means.

e) It shall communicate with gateways/ routers/ nodes/ end points/ access points on RF mesh network (Unlicensed or Licensed frequency band as permitted by WPC/Statutory Bodies in country of deployment as applicable).
f) It shall periodically monitor meter reads/downstream commands and shall retry and reconnect in case of failed events/reads.
g) After power Interruption, on restoration of power supply, it shall establish communication with underlying devices as well as upstream application (HES) automatically.
h) Access point shall facilitate recording of minimum of the following events at HES (for seven (7) days):
   i. No of lost packets
   ii. Retry attempts
   iii. Missed periodic reading
   iv. Failure to connect
   v. Tamper events
i) It shall be capable to handle interval data of suitable nos. of any type of Smart Meter. Access point shall be able to acquire and send data to HES for full capacity (No. of meters/field devices it is designed for) within a suitable time period to achieve the performance level. Full capacity of access point is required to be indicated in the offer.
j) Gateway / Router / Access point shall support remote firmware upgrades as well as remote configuration from the HES.
k) The Gateway / Router / Access Points shall have provision to maintain the time and date information and shall always be in Time synchronization to the HES server via NTP to sub second accuracy. The Gateway / Router / Access Points, shall support time distribution to each Mesh Node.

3.5 Head End System (HES)

1) The main objective of Head End System is to acquire meter data automatically from meters without any human intervention and monitor parameters acquired from meters.
2) This application should be suitable to support collection & storage of meter data for advertised quantity of meters with facility of future expansion as per requirement of MSEDCL.
3) HES shall be responsible for discovery of all Smart Meters once deployed in the field, the periodic collection of all meter data as well as the processing of all alarms and commands such as connect/disconnect for those meters.
4) HES would perform all the requisite functions as per the defined functionalities of AMI. HES shall ensure data integrity checks, for example, checksum, time check, pulse, overflow, etc. on all metered data
5) HES shall be developed on open platform based on distributed architecture for scalability without degradation of the performance using additional hardware. HES should scalable to handle applicable workloads upto 100% meter quantity per region.
6) The bidder shall provide HES which shall be cloud enabled and support deployment with high availability clustering and automatic load balancing that ensure hardware as well as application failover. Adequate data base and security features for storage of data at HES need to be ensured. Bidder shall deploy HES on cloud. Cloud charges for instance including cost of all licenses required for OS, database, software tools etc. required for hosting of HES for entire contract period, will be borne by the bidder. Also the cloud infrastructure (Server, storage, communication links etc.) required for integration with MSEDCL systems will be in bidder's scope. Conditions for cloud deployment are given under clause No. 3.7.
7) Following minimum functions should be supported by HES.
   a. On power up after installation, Smart Meter shall register itself automatically into the HES along with its metering profile. The HES shall store meter profile status by meter type, hardware & software versions, device IDs, logged in / logged out details etc.
   b. Upon deployment and establishment of communication, it shall be possible for field level end device nodes (NAN/WAN) like Router/Gateway, Access Point, DCU to have self-discovery and registration.
   c. Acquisition of meter data on demand & at user selectable periodicity. On demand meter read may be for single meter (unicast) or for a group of meters (multicast).
   d. Two way communication with meter/DCU.

e. Remote Connect/disconnect: Signals for connect & disconnect of switches present in end points such as meters. This facility shall be provided for both single meter (unicast) as well as for a group of meters (multicast).
f. Audit trail and Event & Alarm Logging.
g. Ability to redirect messages including configuration commands from the MDM in order to reach the desired meter.
h. Maintain time sync with DCU / meter.
i. Store raw data for defined duration (minimum 3 days). HES shall hold the data before it is transferred to the MDM.
j. Handling of control signals/event message on priority.
k. Manage time distribution to ensure that nodes / meters always have an accurate RTC using NTP servers. The time distribution mechanism shall take into account the network latencies.
l. Setting of meter configurable parameters.
m. Critical and non-critical event reporting functionality.
n. Device management functionality to get periodic updates from devices on health check, hardware & firmware version, location mapping etc.
o. The data collection and computation for the purpose of SLA penalties should be automated.

8) **Configuration**: HES shall facilitate configuration of following minimum AMI parameters:
a. Load profile capture period
b. Demand integration period
c. Setting of parameters for TOU billing
d. Prepaid/Post-paid configuration.
e. Billing Date/month-to-date for prepaid meters
f. Clock setting/time synchronization
g. Load curtailment limit
h. Event setting for connect/disconnect
i. Number of auto reconnection attempt
j. Time interval between auto reconnection attempt
k. Lock out period for endpoint (meter) relay.
l. Remote firmware update: It shall be possible to update the firmware of the meters in both Unicast (one to one) and in Multicast fashion (Group of meters). It shall be also possible to have remote firmware upgrade for an individual and a group of nodes (NAN/WAN, Routers/Gateways/Access Point, DCU :
m. Password setting
n. Push schedule
o. Setting of threshold limits for monitored parameters as per IS15959 Part-II.
The bidder may suggest more parameters as per the requirement.

9) **Communication**:
The following communication functions with network devices shall be supported:

a) HES shall communicate with DCUs/access points using WAN technology
b) HES shall encrypt data for secure communication
c) HES shall be able to accept data according to IS 15959 part-2 /part 3 and latest amendments
d) HES shall automatically retry for missed data; the number of retry attempts shall be configurable
e) To receive confirmation on successful execution of a command
f) HES shall ensure data integrity checks, for example, checksum, time check, pulse, overflow, etc. on all metered data

10) **Monitoring and Reporting capability:**
HES shall have critical and non-critical reporting functionality. The critical & non-critical information generated from this reporting functionality shall be made available to MDM at user configurable periodicity.

I. Critical Reporting
HES shall have alarms and keep record of following events:

a) Event log for node's (meter) events such as tamper/power failures etc.
b) Data not received from nodes/end points

c) Relay does not operate for connect / disconnect

d) Communication link failure with nodes/end points

e) Network Failure

f) Power Failure

II. Non-Critical Reporting

HES shall report and keep record of following communication failure events:

a) Retry attempts

b) Missed periodic reading

c) Failure to connect

HES shall support reporting of communication failure history of nodes/routers/access points etc. and give an exception report for nodes/routers/access points not communicating for last 0 – 24 hours (the reporting period shall be on user configurable period). HES shall have feature to send email/SMS notification of configured alarms & events to its users.

11) **Network Management System (NMS) requirements Specific to HES**

The Network Management System (NMS) function within the HES shall manage communication network and its associated devices and monitor the performance of network. This module shall provide real time information about the IP network and its associated NAN/WAN modules in the field device/s.

a. NMS shall be able to collect parameters viz. terminal status, device status, next hop information, RF / PLC signal strength, Hardware/software version numbers, communication logs/events etc. For cellular WAN network, it shall be able to constantly monitor the meter WAN module for its connectivity and signal strength and quality

b. NMS function shall be able to perform ping & trace-route to an individual and a group of Nodes (NAN / WAN), Routers /Gateways / Access Point, DCU.

c. NMS function shall routinely check the logged in status of the end node / field device and its availability in the network for data exchange. In case of failure to get the 'alive' message from the end node/field device, it shall mark and notify the node as logged out. It shall be also possible to restart of a node (NAN/WAN) as well as trigger a hardware reset of the node.

d. NMS function should be able to collect and store monitoring profiles from End Points (NAN/WAN modules) and network devices for performance evaluation, and troubleshooting purposes. Historical logs of monitored profiles shall be available analysis through standard reporting tool.

e. If GIS is enabled, then topology, location (lat/long) and status of all network nodes shall be visible on GIS map.

12) Access of HES should be given to MSEDCL team with administrator role. MSEDCL users should be able to monitor and control the HES.

13) Data upload: In case meters are not communicating with HES, meter data such as energy parameters, tamper data, load survey data will be downloaded through optical port and there shall be provision to upload the same.

14) Head End System should be integrated with bidder's Meter Data Management system (MDM) & existing systems of MSEDCL. Integration of HES with MSEDCL systems may be done using Web Service based APIs. Inter application data exchange may be provided through XML/JSON format. Meter data received by HES should be passed to MDM. MDM will calculate credit balance for a consumer & accordingly decide meters to be disconnected/re-connected & pass such meters to HES. Then, HES will initiate commands to connect/disconnect meters.

15) MSEDCL may suggest changes in above functionalities, reports in HES. Also MSEDCL may introduce new functionalities. The bidder shall modify the HES as per the MSEDCL requirements, without any additional cost, before go-live period.

3.6 Meter Data Management System (MDM)

1) The Meter Data Management system (MDM) shall support storage, archiving, retrieval & analysis of meter data and various other MIS along with validation & verification algorithms.

2) The MDM shall be a scalable and COTS product. This application should be suitable to support collection & storage of meter data for advertised quantity of meters with facility of future expansion upto 100% meter quantity per region as per requirement of MSEDCL.

3) It shall act as a central data repository with interactive dashboard. MDM shall have capability to import raw or validated data in defined formats and export the processed and validated data to various other systems sources and services in the agreed format. It shall provide validated data for upstream systems such as billing, analytics, reporting, etc.
4) The bidder shall provide MDM which will be deployed on cloud. Cloud charges for instance including cost of all licenses required for OS, database, software tools etc. required for hosting of MDM for entire contract period, will be borne by the bidder. Also the cloud infrastructure (Server, storage, communication links etc.) required for integration with MSEDCL systems will be in bidder's scope. Conditions for cloud deployment are given under clause No. 3.7
5) MDM shall have the ability to selectively choose which data to be maintained and which to be purged or archived as per requirement of MSEDCL.
6) Asset Management :

a) The MDM shall maintain information and relationships between the current installed meter location (apartment, shop, industry/ address etc.), Consumer information (Name etc.), Consumer number, Meter ID, Type of Meter (type of consumer, 1 phase/ 3phase, with or without relay, etc.), Meter configuration (Demand integration period, Load profile capture period etc.), GIS supplied information (longitude, latitude, connection with feeder/ transformer/ pole etc.) etc.
b) The software should support tracking the status of meters and communication equipment from the date when they are installed in the field. The history of in-service asset location is maintained throughout the device life with start and end dates associated with each in-service location reference.
c) Ability to report and log any damage / deterioration in the meter attributable to consumer /utility.

7) AMI Installation Support

a. The MDM shall also support device lifecycle management from device registration, installation, provisioning, operations and maintenance to decommissioning etc. The MDM shall generate exceptions for meter or modules not delivering the correct meter data after installation.
b. The MDM shall provide a reconciliation report that identifies the meters that have been installed but not communicating for a designated (configurable) period. MDM shall generate reports on the number of meters installed in comparison to the number of meters successfully communicating.

8) Meter Data

a) The MDM shall accept input, process, store, and analyze Meter data from HES and meter data collected through handheld meter reading instruments and manual meter reads. In case of manual reads, provision should be there to insert associated notes such as assessed energy, etc. It would responsibility of bidder for manual meter reading in case of any communication failure, etc. with seven (7) days of such failure.
b) The MDM should accept input, process, store, and analyze non-billing meter data such voltage and power quality data (such as under/over voltage, out of band frequency, etc.) as they are available from HES. The MDM should also support schedule and on-demand meter reads and pinging of meter energized states by authorized users and by other utility systems.
c) The MDM shall provide storage and retrieval of all collected Meter Data, events and alarm. It shall have capacity of storing at least 1 year data or more (as required by the utility) via archiving. Further, archival data should be retained for entire contract period.
d) All data older than 60 days should be archived. Bidder's solution should describe the process of archiving and restoration from the archive.
e) Correctly track & resolve energy usage across meter changes with no loss of individual meter data.
f) Provide complete history and audit trail for all data collected from meters including commands sent to meters and other devices for 30 days (configurable period).
g) Execute on-demand read processes
h) Handle special metering configurations such as net metering/pre-paid metering/multiple meters at same premises.
i) The MDM shall have the ability to manage at a minimum 5-minute interval data.
j) The bidder shall ensure data integrity checks on all metered data received from data collection systems

9) Data Validation, Estimation, and Editing (VEE)

a) The validation and estimation of metered data shall be based on standard estimation methods (such as max/avg. of past three days, max/avg. of past X number of similar weekdays, max/avg. of similar blocks of past X numbers of similar weekdays, etc.). The MDM should also support and maintain following data-
   i. Registered Read Data including register reads, daily billing cycle, as well as derived billing determinants such as TOU
   ii. Interval Data channels with variable intervals and variable units of measure
   iii. Calculated Data that is derived or computed such as billing determinants and aggregated loads.
   iv. Event data storage of all collected event and alarm data from meters, network equipment, and MDM itself

b) MDM shall flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur in the cumulative ("CUM") register reads
   i. CUM decrements within a billing cycle (except net-metering)
   ii. CUM reads increments more than configurable threshold
   iii. Future or old read dates
   iv. Number of digits exceeds number of meter dials

c) MDM shall detect, flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur in Time of Use (TOU) register reads
   i. Register decrements (except net-metering)
   ii. Resets (to zero) (except net-metering)
   iii. CUM reads increments more than configurable threshold
   iv. Future or old read dates
   v. Erratic compared to CUM read (sum of TOU reads minus CUM read)

d) MDM shall detect, flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur in Demand register reads
   i. Do not reset on cycle
   ii. Do not reset coincident with consumer move-out or move-in
   iii. Reset off cycle inappropriately
   iv. Too high

e) All data shall be transferred to billing system after meter data validation and estimation.

f) The MDM shall maintain both the original received raw data in a non- manipulated state, in addition to VEE data.

g) Notwithstanding the latency of data collection via the AMI system, once the MDM receives meter read data, the VEE process occurs in real-time and the post-VEE data is then immediately available to user or external systems.

h) The MDM shall be able to automatically flag data changes from manual edits, VEE (Validating, Editing and Estimating) rules and data source corrections and electronically generate audit trail with timestamps and user-ids.

10) Billing Determinants Calculations

The MDM-

a) Shall allow configuring multiple TOU options (e.g. the number and duration of TOU rate periods) by consumer type, tariffs and day type (weekend, weekdays, and holidays) and by season.

b) Shall support the processing of interval data into billing determinants to include the following at a minimum:
   i. Total Consumption
   ii. Consumption in different time blocks for ToU billing
   iii. Maximum Demand (in kW and kVA)
   iv. Number of tamper counts
   v. Average power factor

c) Shall process interval data and frame it into the appropriate TOU periods for consumption and demand; for example, roll up 15/30-minute data intervals into hourly data.

d) Shall have the ability to properly account for special metering situations such as check metering, sub metering, prepaid metering and net metering when calculating billing determinants and sending them to billing and other systems.

e) Shall have the ability to properly account for special situations including, but not limited to, curtailment requests, demand response scenarios when calculating billing determinants and sending them to billing software.

f) Shall have the ability to facilitate implementation of automatic compensation payments by Utility to consumers for sustained outages when requested. Compensation calculations would require cross checking with billing and consumer balance information to ensure that disconnection is not construed as a no supply event.

11) Prepaid functionality

The prepaid functionality can be availed at smart meter level or through MDM. The MDM with the help of the corresponding HES, should be able to switch the Smart Meter between prepaid and post-paid modes by a simple change in configuration of the Smart Meter firmware remotely. The following prepaid functionality shall apply.

a) MDM shall use consumer attributes from Utility New connection (NC) system to,
   I. enrol and setup new prepaid/ post-paid consumers
   II. migrate existing post-paid consumers to prepaid mode and vice versa

b) An appropriate pre-payment application engine shall support the pre-payment metering capability through the delivered system.

c) The prepaid engine shall ensure that payment and connection parameters are stored centrally, and the details are updated to MDM and utility consumer portal. Information required by consumer's Mobile App and web portal are shared in near real time.

d) Prepaid consumers shall be provided facility to recharge their account by logging on to the utility web portal/web self service (WSS)/consumer app or by any other existing systems of utility to accept payment such as online cash collection system (OCCS).

e) The prepaid engine shall periodically monitor the energy consumption of prepaid consumer and decrease the available credit based on consumption. For this purpose, the MDM shall fetch billing data (kWh/kVAh consumption and MD) at configured intervals from the prepaid meter. The raw billing data shall be subjected to standard VEE rules before being used to update recharge balance with the help of applicable tariff slabs. The credit balance is updated into meter at re-charge time.

f) The prepaid engine shall be programmable for tariff structure, tax / rebate, duty, tariff slabs etc. as per the orders given by MERC from time to time. There should be facility to define tariff structure for different tariff categories e.g. residential, commercial, Industrial, etc. Also there should be provision to update tariff structure as per MSEDCL requirements. The tariff structure should include following parameters.
   i. **Fixed Charges**: Prepaid engine shall be able to deduct Fixed charges as a whole for the full month as per the applicable Tariff at the beginning of month.
   ii. **Energy Charges** : The software shall have capability for defining minimum six tariff slabs. These slabs will be based on number of energy units consumed. It shall be possible to change the slabs. The tariff shall be applicable for the full month as per the tariff category.
   iii. **Electricity Duty**: It shall be possible to define electricity duty percentage through MDM which will be levied on recharge amount. The electricity duty rate will depend upon applicable tariff category.
   iv. **Taxes**: There shall be provision to define various taxes in MDM which has to be levied on recharge amount. E.g. Tax on sale of electricity (ToSE), if applicable.
   v. **Fuel Cost:** The software shall have provision to define fuel cost charges for different tariff categories. These charges will deducted from balance of consumer as per units consumed.
   vi. **Wheeling Charges**: There shall be provision to define wheeling charges for different tariff categories. These charges will deducted from balance of consumer as per units consumed.
   vii. **Online Payment Discount:** The software shall have facility to define online payment discount percentage on recharge amount. Accordingly the discount amount shall be calculated on recharge amount, if paid online.
   viii. **Rebate:** The software shall have facility to define rebate percentage on recharge amount. Accordingly the rebate shall be given on recharge amount.
   ix. **Debt Management**: It shall be possible to collect the Debt from the consumers with the use of MDM. The Debt percentage shall be defined in the MDM.

g) The prepaid engine should be able to automatically apply different TOU tariffs for future date lines, while calculating consumer credits.
h) The system should send connect/disconnect command based on of available credit as per notified rules & regulations.
i) The system should send low-credit notifications to the consumer when their balance approaches a pre-configured threshold. Alerts shall initiate on low credit and load connection/disconnection. The alerts shall be posted on the utility consumer web Portal/ App in real time and sent through SMS and email. Consumer should also be alerted through other mechanisms such as one-time alarm / beep from the meter, LED blinking, message, etc.
j) It shall be possible to configure an "emergency" credit limit in INR as well as day terms. This emergency credit shall be used as reserved amount that is consumed when consumer credit is exhausted. The credit amount shall be adjusted in next recharge transaction. The amount of emergency credit will be decided by utility.
k) It shall be possible to configure certain prepaid consumers where auto-disconnections shall not happen due to negative credit. The conditions/protocols for auto-disconnections will be provided by the utility.
l) The pre-payment function as part of MDM shall also have a facility to configure arrear recovery mechanism to recover arrears from a consumer. Some of the indicative mechanism to recover the same can be recovery of [X]% from every recharge amount while the rest goes as charging amount till all the arrears are recovered. Alternately the arrears may be settled in next [X] installments as decided by utility such that not more than 50% of any installment shall be adjusted towards arrear.
m) MDM shall have facility to configure 'happy hours'. In this duration, disconnect command should not be sent by system, even if consumer credit & emergency credit is exhausted. The happy hours are 17:30 to 11:00 on week days. On Sunday and fixed holidays, the happy hours are entire 24 hours. There should be provision in MDM to feed holidays. After end of happy hours, disconnect command should be sent, if consumer credit & emergency credit is exhausted. Emergency credit amount & amount for consumption during happy hours period shall be adjusted in next recharge transaction.

12) Exception Management

a. Ability to capture and log data exceptions, problems and failures and to generate management reports, provide trend analysis, automate generation of service requests and track corrective actions.
b. Ability to group, prioritize, filter and send system generated alarms and events to utility applications such as consumer mobile app etc.
c. Exception Generation - MDM shall generate exceptions based on configurable business rules including but not limited to the following:
    i. Meter tamper alerts
    ii. Communication module health alerts for meter/DCU
    iii. If the consumption is less/more than pre-defined average consumption
    iv. Negative Consumption (not for net-metering)
    v. Power outage indications received from the Smart Meter

13) Service Orders

a) The MDM shall generate service orders based on configurable rules for various events and alarms such as stop meter, tampers, problem in communication networks, etc.
b) MDM shall send service orders via SMS, email, etc. with the email addresses / phone numbers being configurable. MDM shall receive feedback on action taken on the service order and track the status of service orders until resolution.
c) Service order tickets could be generated by MDM but processed and closed under jurisdiction of the HES-NMS combine. If the utility already has a separate Workforce Management System (WFM), then the service order tickets can be routed from the MDM and the NMS to the WFM for completion of the tasks and reporting.

14) Revenue Protection Support

a) Ability to analyze meter tampering flags, power outages, usage trends and usage profiles to identify potential energy diversion situations, and produce daily reports, monthly reports and service order requests for investigation.
b) The business rules for revenue protection alerts shall be configurable via a user-friendly interface.
c) The MDM shall filter out revenue protection alerts that may be caused by field activities if the field activity information is provided to the MDM.
d) The MDM shall support the analytics/investigation (i.e. view current and historical usage patterns) to validate suspected revenue protection issues.

15) Analytics

The MDM shall have analysis capability based on configurable business rules including but not limited to the following:

a. Display consumption/load profiles by configurable period (15/30 min, hour, day, month, year etc.) day type (weekday, weekend, holiday, festival wise etc.) and by tariff, consumer type (hospitals, schools, govt. offices, multiplexes, commercial, residential, industrial etc.), or any user specified collection of meters.
b. Generate peak & off-peak load patterns by aggregating all loads of consumer group/consumer type/DT/Feeder over configurable period/day type.
c. Perform load analysis for different groups and categories of consumers in different weather conditions.
d. Ability to provide the data to load forecasting, load research or demand response applications and perform error management such as missed reads and intermittent meter reads before sharing data with load forecasting, load research or demand response
e. Ability to configure the system to effectively visualize consumption trends, identify unusual patterns, and visualize load analysis to understand which assets are being over utilized.
f. Analyzing data to identify new patterns of usage, Setting fraud alert / transformer overload alerts / demand – supply gap alert etc.
g. Ability to receive and store outage and restoration event data from Smart Meters and outage systems and to log all such events for analysis and also support calculation of compensation payments for sustained outages. Five reliability indices shall be calculated,
    i. System Average Interruption Duration Index (SAIDI), which is sum of all consumer interruption durations in a given period over total number of consumers served.
    ii. System Average Interruption Frequency Index (SAIFI), which is the total number of sustained interruptions in a given period over total number of consumers served.
    iii. Consumer Average Interruption Duration Index (CAIDI), which is sum of all consumer interruption durations in a given period over the total number of sustained interruptions in that given period
    iv. Consumer Average Interruption Frequency Index (CAIFI), which is the total number of sustained interruptions in a given period over the total number of distinct consumers interrupted in that given period
    v. Momentary Average Interruption Frequency Index (MAIFI), which is the total number of consumer interruptions less than the defined time (1 or 5 minutes) over the total number of consumers served.
h. These reliability indices shall be calculated for each month, for individual feeders and aggregated annually for the whole utility. The source data for outage shall be last gasp and the first breath messages from DT/Feeder level meters. These computations shall be independent of similar computations made by any OMS application.
i. Ability to alerts on DT/ Feeder level overvoltage & back-to normal event and under-voltage and back-to-normal events. Based on these alerts the system should calculate the duration in which the DT/Feeder remained outside the nominal zone of defined voltage. Similar calculations should be allowed for power factor and current unbalance.
j. Identify & visualize poor performing assets such as feeder/DT on multiple criteria such as energy losses, outage duration etc. through appropriate colour coding depending on severity thresholds.
k. Analyze data of net-metering consumers to identify patterns of energy export to grid on hourly/weekly/monthly/yearly basis.

16) Reporting

The Report function shall enable the Utility to deliver reports in standard digital format such as PDF, Excel, etc. All queries for report generation shall be made through user driven drop down menu in GUI of Utility user interface. The bidder shall provide example queries to support internal report generation needs. The GUI shall have provisions to set up or change report delivery to configurable email addresses, network file directories, ftp sites or printer systems without modifying source program code and without any proprietary language skills.

The MDM shall generate following reports (an indicative list only). Utility may request for additional reports as well during the contract period.

i. Daily data collection report
ii. Usage exceptions
iii. VEE validation failures
iv. Missing interval Read date and times (on hourly, daily, weekly & monthly basis) and their trends
v. Physical meter events (install, remove, connect, disconnect) & meter reset report
vi. Meter flags
vii. Meter inventory
viii. Defective meters
ix. AMI performance measurements
x. Threshold exception
xi. DT condition monitoring
xii. MIS reports and analytical reports including but not limited to following:

1) Payment collection summary and details in a day/week/month/year or as per user selectable period and trends
2) Number / list of disconnected consumers due to inadequate prepaid account balance
3) Prepaid consumers running low on account balance
4) Connected consumers
5) Critical notifications sent to consumers
6) Revenue analytics as per consumption pattern of consumers (in terms of money and energy units). This shall also include automatic compensation payments by Utility to consumers for sustained outages, if implemented
7) Data-driven Analytics reports by leveraging AI/ML based technologies

Following high level reports for Utility Management shall be generated automatically at specified frequencies to help management with business decisions

Category	Report	Frequency
Reliability Indices	SAIFI and SAIDI; CAIFI and CAIDI; MAIFI of the feeder(s) and connected consumers would be tracked to measure the improvement in the same overtime and establishing reference levels	Daily, Monthly and User Selectable Time Period
Load Management	DT Loading (Categorize DT as overloaded, optimally loaded, near optimal, under loaded)	Daily, Monthly and User Selectable Time Period with configurable near real time alerts
	Load recording (Consumers): Actual consumption recorded higher than the sanctioned load identifying the top 10 consumers	Daily, Monthly and User Selectable Time Period with configurable near real time alerts
	Load Management Report (Identify top overloaded DTs) and load rise trend	Monthly and User Selectable Time Period
Power quality	Voltage Deviation Index and Frequency Deviation Index (DT/ Feeder)	Daily, Monthly and User Selectable Time Period with configurable near real time alerts
	Low Power Factor (DT/ Feeder)	Daily, Monthly and User Selectable Time Period with configurable near real time alerts

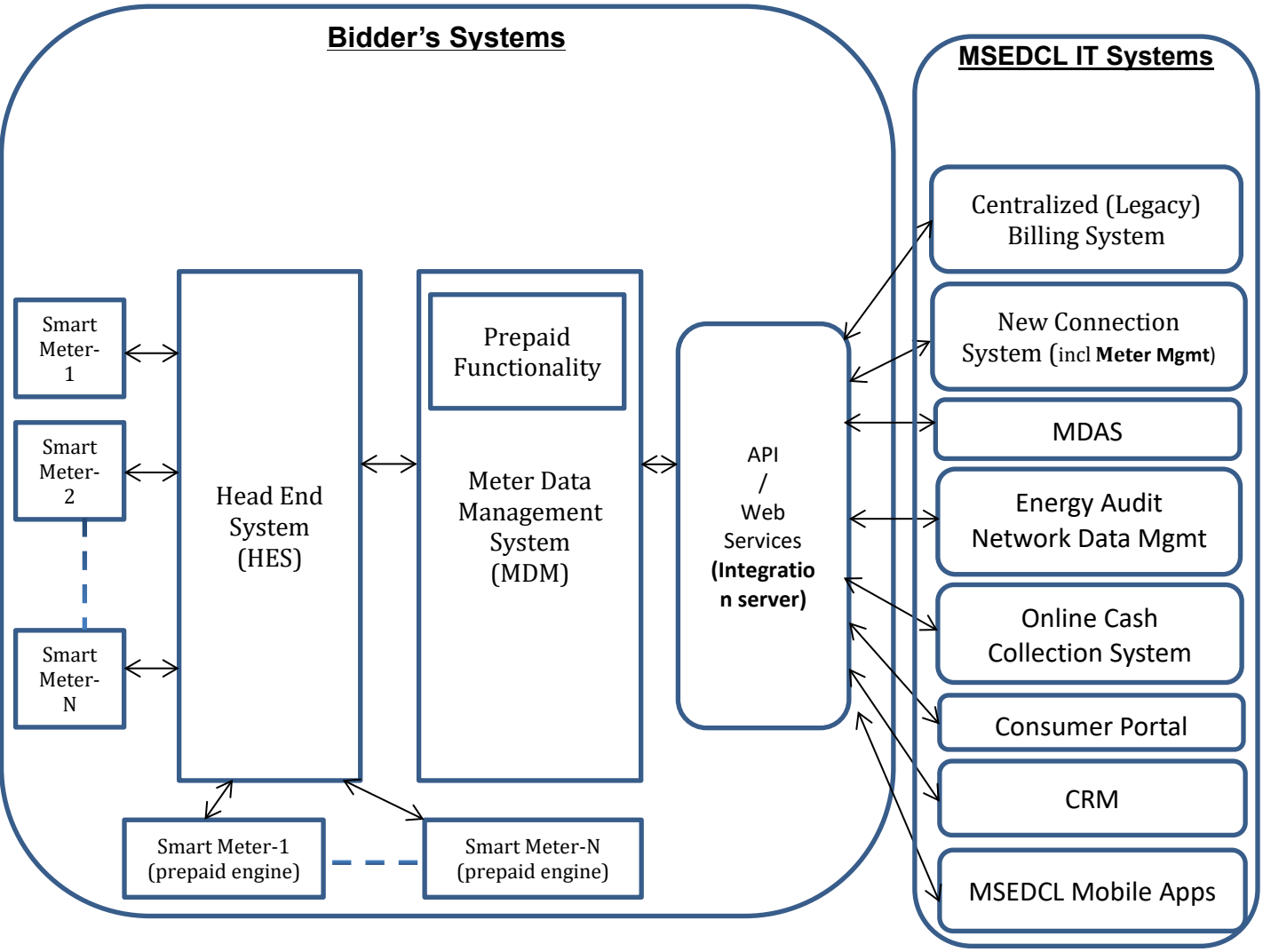
Category	Report	Frequency
	Meter Current Unbalance (DT/ Feeder)	Daily, Monthly and User Selectable Time Period with configurable near real time alerts
Loss Analytics	Tamper Alert: as per IS 15959 Part 2	Daily, Monthly and User Selectable Time Period with configurable near real time alerts
	Comparison Consumption (system used to detect & track theft suspects)	
	Consumption lower than the expected pattern (pattern of previous year applied to the monthly average) or monthly average	
Management Summary Report (Dashboards)	Summary report on top overloaded DTs/ Feeders, Top feeders/ DTs with most outages (number and duration), Top feeders with most power quality issues (over voltage, under voltage, current unbalance, out of band frequency), DTs with high failure rate	Monthly and User Selectable Time Period

17) Integration with existing systems of MSEDCL

MDM shall interface with MSEDCL systems on standard interfaces, and the data exchange models and interfaces shall comply with CIM/ XML/IEC 61968/Multi Speak / IS15959. MDM solution shall be SOA enabled. All necessary upstream interfaces for MDM should be structured. MDM should be integrated with MSEDCL systems using Web Service based APIs. Inter application data exchange may be provided through XML/JSON format.

MDM integration with existing systems of MSEDCL shall include but not be limited to the following:

a) Centralized billing system (CB)
b) New connection system (NC)
c) Meter Data Acquisition System (MDAS)
d) Energy Audit (EA) system
e) Online cash collection system (OCCS)
f) Consumer Portal
g) Consumer Relationship Management CRM
h) Mobile applications such as New Connection (NC) app, consumer app etc.



Platforms used for various MSEDCL IT systems are as below.

Sr. No.	Name of system	Front-End	Database
1	Centralized (Legacy) Billing System	Java	Sybase
2	New Connection System (incl Meter Mgmt)	Java	Oracle
3	MDAS	Java	Oracle
4	Energy Audit Network Data Mgmt	Java	Oracle
5	Online Cash Collection System	Java	Oracle
6	Consumer Portal	PHP, .Net	Oracle
7	CRM	. Net	MS SQL
8	MSEDCL Mobile Apps	Java	Oracle

3.7 Deployment of HES & MDM on cloud

Bidder shall deploy HES & MDM on cloud. Following conditions will apply for cloud deployment.

a. All Services including data should be hosted in India.

b. The cloud instance should be specifically dedicated to MSEDCL and utilized by MSEDCL only.

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c. Data transmission charges and all charges related to data connectivity etc. should be borne by the bidder.
d. The bidder need to ensure that the CSPs facilities/services are compliant to various security standards and should be verified by third party auditors.
e. CSP should suitably address all the potential risks and issues in cloud implementation including data security and privacy, increased complexity in integration with existing environments, vendor lock-in, application portability between different platforms, exit management / Transition-Out Services etc.

3.8 Cyber Security

For establishing secure and resilient Smart Meter systems, a standardized cyber security framework should be adopted by the bidder in consultation with the MSEDCL and relevant stakeholders. The key elements of the cyber security framework must include:

a) Differentiation of stakeholders into broad categories to aid in proper distribution of responsibilities among stakeholders and avoid overlapping
b) Defined set of responsibilities for each stakeholder group. As a result, the decision-making process is streamlined, and proper management hierarchy is established for handling the reported cyber-attacks. The roles and responsibilities are divided into two groups:
   i. **Cyber – strategy and governance:** The responsibilities under this group relates to the policy and decision-making aspects of cyber security framework
   ii. **Cyber security – risk, operations and compliance:** This group comprises of responsibilities relating to the operational parts of implementing cyber security policies

c) Standardization of security practices and abundant guidance from knowledge bodies while implementing security controls and processes. There are multiple global security standards and Indian standards that are relevant in context of underlying technologies used in smart meters:

i. National Institute of Standards and Technology (NIST) has developed a framework for Cyber Physical Systems (CPS). The Framework provides a taxonomy and organization of analysis that allow the complex process of studying, designing, and evolving CPS to be orderly and sufficiently encompassing.
ii. Department of Electronics and Information Technology (DeitY), Government of India has developed a National Cyber Security Policy. It aims at protecting the public and private infrastructure from cyber-attacks. The policy also intends to safeguard "information, such as personal information (of web users), financial and banking information and sovereign data".

d) Cyber security incident management: The ISO/IEC Standard 27035 outlines a five-step process for security incident management, including:

   i. Prepare for handling incidents.
   ii. Identify potential security incidents through monitoring and report all incidents.
   iii. Assess identified incidents to determine the appropriate next steps for mitigating the risk.
   iv. Respond to the incident by containing, investigating, and resolving it
   v. Learn and document key takeaways from every incident

Notwithstanding the measures suggested above, the following guidelines/strategies shall be taken care of by the bidder for making the entire AMI system immune to Cyber Attacks.

a. All the Hardware, OS and application software shall be hardened.
b. Application, scanning and hardware scanning tools shall be provided to identify vulnerability & security threats.
c. Data shall be encrypted at system/device/technology level.
d. Network Zoning shall be implemented as per the proposed architecture. However, the bidder may suggest other methods of network architecture without compromising the security of the System.
e. Internal user shall be allowed to access all adjacent zones. However, they will not have access to remote network zone.
f. While procuring cyber security items testing must be done and the system must be secure by design.
g. Residual information risk shall be calculated by bidder and same shall be submitted to MSEDCL for approval.
h. All default user id & passwords shall be changed.
i. All log in/out and cable plugs in/ out shall also be logged in Central Syslog server.
j. Penetration & Vulnerability assessment test from CERT-In certified auditors at every six months during FMS period.

k. Auditing by third party at every six months during FMS period shall be in the scope of bidder.
l. As the computer system in NOMC has access to external environment the bidder shall document and implement Cyber Security Policy/Plan in association with the MSEDCL to secure the system.
m. Latest Cyber Security Guidelines issued by CERT-In specified at **Error! Hyperlink reference not valid.**, Ministry of Power (including "Testing of all equipment, components, and parts imported for use in the power Supply System and Network in the country to check for any kind of embedded malware /trojans/ cyber threat and for adherence to Indian Standards – Regarding" vide Order No. No.9/16/2016-Trans-Part(2) published by Ministry of Power, Government of India dated 18 November 2020 and amended from time to time) or any other competent authority shall be followed.

3.9 Data Privacy:

The bidder should describe ensure that the system is compliant with the applicable provisions of the "Reasonable security practices and procedures and sensitive personal data or information Rules, 2011 (IT Act)" as well as shall be committed to work with MSEDCL for compliance to Personal Data Protection requirements. In this regard, the general elements of the data privacy framework may include:

a. MSEDCL shall be the sole custodian of the Smart Meter data. The bidder and its contracted vendors will have limited need basis access to the data. In case of pre-mature termination or at the end of contract, the bidder and the contracted vendors should relinquish all access to the data and transfer the same to the MSEDCL.
b. The bidder is required to prepare and submit a "Privacy by Design" document to the MSEDCL which details out all the policies, practices, processes and technologies employed to manage, and process the Smart Meter data in a secure manner. This should also include the details on methods of anonymization applied to the personal Smart Meter data based on data types defined below:
   i. Aggregated Data: No identification individually and at neighbourhood level unless explicitly required to report
   ii. Anonymized Data: A data set which has individual Smart Meter data but without any personally identifiable information like consumer name, account number, address etc.
   iii. Personal Data: A data set with Smart Meter data tagged with personally identifiable information.
c. AMI system should enable the MSEDCL to get the consumer consent on sharing and processing of Smart Meter data based on following criteria
   i. Consumer consent not required

1) If any type of Smart Meter data is processed by the MSEDCL or a third party on behalf of MSEDCL for the purpose of generating bills, identifying theft, network planning, load forecasting or any related activities that can enable the MSEDCL to fulfil its duty as a licensee.
2) If any type of Smart Meter data is requested by the law enforcement agencies.
3) If aggregated or anonymized data is shared with not-for-profit academics, policy research, civil society entities for research that can benefit the sector in general.

   ii. Opt-out consumer consent

   1) If any type of smart meter data is shared with or processed by any third-party commercial entity to provide services other than as enabled by regulation. In this case, the AMI system should enable the MSEDCL to conduct the following consumer consent process

   • Consumer should be notified and given a time to opt-out

   • Consumer should have the right to change his/her option through the app/web account/direct communication to MSEDCL.

d. AMI system should enable following Data sharing protocol
   i. Data should be shared by providing finite and secure access to the system. The access can be modified or terminated as need be.
   ii. Sharing of part/full database shall be subject to review and consent of MSEDCL.
e. All data sharing shall be recorded and periodically submitted to MSEDCL for review / regulatory requirement
f. The bidder should have a data breach response plan and should communicate to the MSEDCL and consumers in case of any data breach from AMI system
g. The bidder is responsible to conduct 3rd party data privacy audit at least once every year based on evaluation criteria pre-identified by the MSEDCL in consultation with data experts. The audit report should be made

available to MSEDCL. The bidder to take necessary actions on audit observations in consultation with the MSEDCL.

3.10 USE CASES

The key use cases to be enabled by the bidder are provided below. Please note that these are illustrative list of use cases only and is not an exhaustive list. Further please note that all IS Standards shall be applicable.

Sr. No.	Use Case Activity Description	Source	Destination	Info Exchanged
1.	**Collection of Daily Meter Profile**			
1.1	At scheduled frequency HES should pull the Daily Meter Data from Smart Meter over communication Channel	HES	Meter	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
1.2	Meter should send the data to HES. Provision for retrial should be there if Meter data is not collected within time. Consumption details including non-critical events will be in 15 min/30 min block data, and data could be incremental to what was sent by meter in preceding instance.	Meter	HES	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
1.3	HES should send the data to MDM	HES	MDM	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF
1.4	MDM should send the required parameter to Prepaid system for daily charge calculation at least once on daily basis	MDM	Prepaid Engine	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
2.	**Monthly Billing profile collection**			
2.1	Command from Billing system triggered and send to MDM / HES for collection of Monthly billing Data	Billing System	MDM/HES	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
2.2	At scheduled frequency HES should pull the monthly meter data from Smart Meter over the communication channel	HES	Meter	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
2.3	Meter should send the data to HES. Provision for retrial should be there if Meter data is not collected within time.	Meter	HES	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
2.4	HES should decrypt and validate the data collected and send to MDM	HES	MDM	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
2.5	MDM should send the required parameter to Billing system for Monthly Bill calculation	MDM	Billing Engine	Meter Number, reading date & time, kW, kVA, kWh, kVAh, PF, Non-critical Event Code / Date
3.	**Remote Meter disconnection**			
3.1	Meter disconnect operation command after wallet balance calculation	Prepaid Engine/ Billing system	MDM	Meter Number, group of meters, instruction to close switch
3.2	Disconnection alert sent to consumer	MDM	Billing System	Meter Number, group of meters, instruction to close switch
3.3	Meter disconnection operator command	MDM	HES	Meter number, action (disconnect)
3.4	Consumer meter disconnection	HES	Meter	Meter Number, switch status
3.5	Disconnection Status Update	Meter	HES	Meter Number, switch status
3.6	Disconnection Status Update	HES	MDM	Meter Number, switch status
4.	**Remote Meter Reconnection**			
4.1	Meter reconnect operation command	Billing	MDM	Meter Number, group of meters,

	after wallet recharge Billing	system/ Prepaid Engine		instruction to close switch
4.2	Meter reconnect operation command	MDM	HES	Meter Number, group of meters, instruction to close switch
4.3	Consumer meter reconnection	HES	Meter	Meter number, action (reconnect)
4.4	Reconnection Status Update	Meter	HES	Meter number, action (reconnect)
4.5	Reconnection Status Update	HES	MDM	Meter number, action (reconnect)
5.	**Utility detects tampering at consumer site**			
5.1	High priority events captured by Meter sent to HES as and when occurred	Meter	HES	Meter Number, event date & Time with snap shot values of currents & voltages, event Code /description
5.2	High priority events reach MDM for further action.	HES	MDM	Meter Number, event date & Time with snap shot values of currents & voltages, event Code /description
5.3	On analysis and detection of valid tamper event or malfunction, connection is disconnected.	MDM	HES	Consumer number, meter number, action to be triggered (disconnect), action date & time
5.4	HES sends disconnect command to meter	HES	Meter	Meter Number, action (disconnect)
5.5	Meter re-connection order once tamper issue is resolved	MDM	HES	Meter number, action (re-connect)
5.6	HES sends re-connect command to meter	HES	Meter	Meter Number, action (re-connect)
6.	**Missed interval readings**			
6.1	On identifying missed interval, HES will re-acquire data for the missing period from meter	HES	Meter	Meter Number, from date & time, to date & time (for which data is missing)
6.2	On receiving data request command, meter will send data to HES	Meter	HES	Meter Number, reading date & time, kW, kVA, kWh, kVAh
6.3	Missed Interval and Reads Data acquired by MDM	HES	MDM	Meter Number, readings with date & time
7.	**Consumer connection outage/restoration event**			
7.1	Outage/restore event recorded by meter is sent to HES as and when event occurs	Meter	HES	Meter Number, Outage / restoration Date / Time, Power On or Off count
7.2	Outage / Restoration Notification	HES	MDM	Meter Number, Outage/restoration Date/Time, Power On or Off count
7.3	Meter responds to event poll from HES	Meter	HES	Meter number, Status(live/disconnected)
8.	**Remote firmware upgrades/ meter configuration changes**			
8.1	Remote firmware upgrade	MDM → HES	Meter	Firmware

8.2	Configuration Commands: Change tariff parameters, Synchronize clock, Registers reset (status, max, tampering)	MDM → HES	Meter	Meter number, tariff parameters, registers status, event type and priority
8.3	Status update of Firmware/ Configuration	Meter	HES → MDM	
9.	**Load monitoring at demand side**			
9.1	When there is a load violation event recorded in the meter, the information is sent to HES	Meter	HES → MDM	Meter Number, max demand, date & time of load violation
1000.	**Time synchronization**			
10.1	Synchronizing RTCs of meters / DCUs/ACP	HES	DCU/Meter	Time Setting
11.	**Metering network changes**			
11.1	Change / new installation of Meter / DCU Network Hierarchy	Meter / DCU	HES	Network identification info including DCUs
11.2	Change / new installation of Meter / DCU Network Hierarchy	HES	MDM	Network identification info including DCU
12.	**New consumer connection**			
12.1	Requesting instant, interval & events data from meters	MDM	HES → Meter	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
12.2	Acquire instant, interval / events data from meter by HES which then reaches MDM system.	HES	MDM	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
13. Demand read of meters from consumer premises				
13.1	Requesting instantaneous, interval, load profile & events data from meters	MDM	HES→Meter	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
13.2	Acquire instant, interval, load profile & events data from meters by HES which then reaches MDM system.	Meter→ HES	MDM	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
14. Migrate post-paid consumer to prepaid mode				
14.01	Receive migration request	MSEDCL NC system	MDM	Migration request for post-paid consumer with profile
14.02	Get billing attributes	MSEDCL Billing System	MDM	Billing attributes
14.03	Setup prepaid consumer profile in	MDM	Prepaid	Prepaid Consumer

	prepaid engine		Engine	profile
14.04	Request instant, interval & events data from meter	MDM	HES-> Meter	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
14.05	Acquire instant, interval / events data from meter by HES which then reaches MDM system	HES	MDM	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
15. Migrate prepaid consumer to post-paid mode				
15.01	Receive migration request	MSEDCL NC system	MDM	Migration request for prepaid consumer with profile
15.02	Setup postpaid consumer profile in prepaid engine	MDM	Prepaid Engine	Postpaid Consumer profile
15.03	Request instant, interval & events data from meter	MDM	HES-> Meter	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)
15.04	Acquire instant, interval / events data from meter by HES which then reaches MDM system	HES	MDM	Meter Number, Reading date & time, reading params (kWh, kVAh, kW etc.)

3.11 Operational Go-Live:

AMI Solution implemented by the bidder will be declared as Go-live, after successful installation, commissioning, integration and availability of complete meter data of at least 10% meters of the Region in bidder's HES.

3.12 Service level agreement (SLA):

The SLA applicable after go-live is as per Annexure-VIII.

3.13 Variation of Scope:

MSEDCL will have full-undisputed discretionary rights to add or reduce the scope of work/area of interest as per its requirements (+/- 25%) and agency will have to comply accordingly. Anytime during the contract period, MSEDCL may modify it business process/workflow as per its requirements and agency will have to comply with it, without any adverse commercial implications. MSEDCL will have full undisputed discretionary rights to continue solution implementation after the tender contract period.

3.14 Project Deliverables:

The project deliverables will include, but are not limited to:

i. Project plan along with proposed solution document.
ii. Technical specification / Data sheet of Communication module, Communication equipments including module details and chipset details.
iii. Head End System (HES) & Meter Data Management System (MDM).
iv. All the hardware and software tools used in the project as per Bill of Material.

4.1 TIME OF PERFORMANCE:

I) The bidder has to submit the offer for entire region and the milestone project execution will remain as under irrespective of no. of regions:

Contract period requirement:

For supply & installation of meters - 12 month from date of LoA .

FMS Activity - 90 month.

II) The 10% of ordered quantity is required to be commissioned within 3 months from date of LoA & the balance quantity as under:

Month wise details of Milestone to be considered for each region:

The installation period is 12 months and contractual period is 102 months including installation period.

For demonstration the tentative milestone for one region is illustrated as under:

Total Quantity = 3,40,000 Nos. per Region		
Month	**% Qty. to be Supply, installed & commissioned**	**Meter quantity to be Supply, installed & commissioned**
Up to 3rd Month	10%	34,000
4	20%	68,000
5	30%	102,000
6	40%	136,000
7	50%	170,000
8	60%	204,000
9	70%	238,000
10	80%	272,000
11	90%	306,000
12	100%	340,000

III) Installation Milestone

a. The "Installation Milestone" is defined as the milestone when installation and operationalization is completed for the number of smart meters envisaged for the project. The bidder is expected to complete this Installation Milestone as per the table given above. If the bidder completes the "Installation Milestone" ahead of schedule, then the revised date shall be accepted as the date of achievement of "Installation Milestone".

b. As and when the "Installation Milestone" is achieved by the bidder, the Utility shall be obliged to certify the milestone through a written communication giving the date and the meter population installed and operationalized.

c. Time period of contract is 102 months from date of LoA by the employer, which includes survey, removal of existing meters, supply and installation of new smart meters on consumer installations implementation & integration of prepaid solution and FMS activity of above installed Smart meters through MDAS/Central Server.

d. The bidder should complete field survey and installation of meters in-line with tender specification. No extra time for implementation or extension of contract period is allowed.

e. The bidder accordingly strictly adhere to the milestones.

4.2 Project Implementation Schedule

The Project Implementation Schedule for AMI system establishment and timelines for Related Services milestones from date of issue of LoA are given below:

Sr. No.	Milestone	Timeline (in months)
1	Submission of detailed Project Implementation Plan giving the compliance sheet along with the make and model of various infrastructure, hardware & software that are proposed for delivery and operations incl.: • Specification of System • Architecture and Software Solution	Within [15] days from the date of issue of LOA
2	Delivery, site installation, integration and operationalization of 100% of Feeder Meters each with related hardware, software and Equipment	Within [3] months from the date of issue of LOA
3	Delivery, site installation and commissioning of Network Operations cum Monitoring Centre with related hardware, software and equipment; and Delivery, site installation, integration and operationalization of [10%] of Smart Meters each with related hardware, software and equipment and successful operational go- live	Within [3] months from date of issue of LOA.
4	Delivery, site installation, integration and operationalization of 50% of Smart Meters each with related hardware, software and equipment	Within [7] months from the date of issue of LOA
5	Installation Milestone	Within [12] months from the date of issue of LOA.
6	Operational period of the AMI system	From Operational Go-Live till end of the Contract Period
7	Transfer of AMI system to the utility	At the end of Term of the Contract period

4.3 The bidder has to offer the quantity for the entire region failing which the offer is liable for rejection. The L-1 will be arrived as per package cost. Further the bidder may offer different communication technology for different regions. However the L-1 will be arrived as per package cost irrespective of communication technology offered. The bidder has to submit the Regionwise communication technology offered in format attached as Annexure-XII.

4.4 ACCEPTANCE OF SUPPLIES/INSPECTION:

I) Meters shall be inspected by the Purchaser's Executive Engineer/or the representative authorized by the Purchaser before dispatch. .

II) In the event, during the inspection by the Purchaser's Inspecting Officer, if it is observed that the quantity actually offered for inspection is less than the quantity indicated for inspection in the inspection call, the Purchaser shall be entitled to recover from the supplier, the actual expenses incurred for arranging the inspection, and the supplier shall not dispute the amount to be recovered.

III) The supplier shall submit the test certificates/reports from any approved laboratory or the laboratory of his own for the respective quantity of material, before dispatch. The material shall not be dispatched unless and until the test certificates are approved by the Purchaser.

IV) All the necessary help shall be extended by the supplier to the authorized representative of the Purchaser to carry out testing of equipment/materials.

5.0 BIDDING PROCEDURE AND INSTRUCTION TO BIDDERS

5.1 ELIGIBILITY TO BID

The bidding process will be open to any agency who satisfies the **Qualifying requirement as per cl. no 2.0.**

1. Bidder is eligible to submit only one bid.
2. A Bidder shall submit only one Bid in the same bidding process, either individually as a Sole Bidder or as a Lead Member of a Bidding Consortium. Any member of the bidding consortium, including its Parent(s) and/or Affiliate(s), whose technical and financial capabilities are showcased for meeting the criteria as mentioned in Clause 2 of RFP (QR), shall not separately participate directly or indirectly in another bid in the same bidding process for meeting the criteria.
3. Bids will be accepted by MSEDCL for those Bidders who have confirmed for their participation as mentioned in the Tender.

The bidder will be responsible for submitting the proposal and it will be the single point-of-contact for all information and clarification throughout the Procurement Process.

5.2 To be qualified for award of Contract, bidder shall also submit:

I) Copies of original documents defining the constitution or legal status, place of registration and principal place of business for the bidder; and

II) A written power of attorney / letter of authorization authorizing the signatory of the bid to commit the bidder; and Audited annual accounts including balance sheets and other financial statements for any of the three (3) consecutive financial years (FY 18-19, FY 19-20, FY 20-21 & FY 21-22); and

III) Authority to seek references from the bidder's Bankers along with details of the Banks;

IV) Proposals regarding work methods, scheduling and resourcing which shall be provided in sufficient detail to confirm the bidder's capability to complete the work in accordance with scope of work and the time for completion, including qualifications and experience of personnel proposed for the contract.

V) The bidder shall submit the declaration along with the bid as below.

a. The business dealings with the agency have not been debarred by any Ministry of GoI / GoM/ state owned electricity distribution utility and still in force.

b. The Directors, Proprietors, Partners, Employee(s) or owner of the agency have not been either jointly or severally guilty of malpractices in relation to its business dealings with the Government or MSEDCL during the last five years.

5.3 Overview of bidding process

The Bidding Process would comprise of following sequential steps. MSEDCL reserves the right to reject all or any of the Bidders or Bids or discontinue or cancel the bidding process without assigning any reason whatsoever. These include the following:

i. It will be 'Single Bid Two Stage' tender process.

ii. The key features of the tender in the form of Invitation for Bid will be released by MSEDCL on the MSEDCL website http://www.mahadiscom.in on tender release date.

iii. Entire bidding document shall be available only in electronic format (soft copy) and is to be downloaded from Employer's website http://www.mahadiscom.in (or directly from

URL https://etender.mahadiscom.in/eatApp/) from tender release date onwards. It shall be the bidder's responsibility to ensure that the entire bid document is downloaded from the requisite website. No hard copy of tender document will be provided. All the subsequent instructions/corrigendum to the bidding document etc. shall also be available on the website mentioned above.

iv. To clarify any points on the tender, MSEDCL will organize a Pre-Bid Meeting, wherein all the interested bidders can participate. This meeting is not mandatory for the bidders.

v. The response to the Tender has to be submitted by the bidder who will be designated as a Bidder for the purpose of this Tender. The entire bidding process will be e-Tendering process. Bidder has to submit the documents through E-tender application in soft copy i.e. PDF as well as word/xls format

vi. MSEDCL will open the Technical & Commercial Bid and the technically qualified Bidders will be informed based on the evaluation.

vii. The technically qualified bidders may be asked to present their technical capabilities either by onsite presentation at MSEDCL or demonstration of Proof of Concept before the price bid is opened.

viii. Technically Qualified Bidder's Price Bid will be taken forward for comparison & the Lowest Price Bid will be declared as the Bid Winner.

ix. In case the bidder is successful, the contract agreement will be signed between MSEDCL and the Bidder.

6.0 CONTENTS OF THE BID

Tender Fee & Bid Security (EMD)

a) Tender Fee

A Non-Refundable Tender Fee of **Rs. 25,000 (Rupees Twenty Five Thousand Only)** plus 18% Goods and service tax (GST) shall be furnished only by way online payment through e-tendering website.

b) Bid Security (EMD)

The bidder should pay the Earnest Money Deposit (EMD) @ Rs. 1 Crore (Rs. One Crore only) per region in the form of BG as per the Annexure – IV (A) enclosed with tender documents having validity of 180 days from opening of tender. Interest shall not be allowed on EMD.

However, bidders from the following categories are exempted from payment of earnest money deposit.

1. All Government and semi Government institutions under Govt. of Maharashtra and Zilla Parishad in Maharashtra and fully owned undertaking of any State Govt. and Govt. of India only for the items manufactured by such institutions.
2. Micro and Small Enterprises registered under Micro, Small and Medium Enterprises Development Act-2006 only for the items mentioned in their permanent registration certificate at the time of vendor registration.
3. The bidder registered with N.S.I.C. and those who have attached valid N.S.I.C. Registration Certificate for the items mentioned in their permanent registration certificate at the time of vendor registration.

The benefits mentioned in (1) to (3) above shall be available only to those items approved during the registration process and subsequent updates in registration up to the date of submission of this tender.

Exempted bidders should upload a latest valid certificate issued by any approved body of 'Ministry of Small & Medium Enterprises' (MSME) such as 'National Small Industries Corporation' (NSIC) or 'District Industries Centre' (DIC) for EMD exemption.

i. Bidder should upload the Scanned copy along with the Bid documents on E-Tender website. However, Bidder will have to submit the Bank Guarantee to the MSEDCL on or before the last date of Submission of Tender.

ii. Any tender not accompanied by the requisite Earnest Money Deposit (EMD) shall be rejected and shall not be considered for evaluation.

iii. The bid security of the successful bidder shall be returned after (i) acceptance of LOA by the bidder and (ii) the contract performance security is furnished by the bidder and accepted by the owner.

iv. Unsuccessful bidder's bid security will be discharged/returned as promptly as possible.

v. The bid security may be forfeited:

(a) If the bidder withdraws its bid, except that written notice of the withdrawal of bid is received by the employer prior to the deadline for submission of bids; or

(b) If the bidder does not accept the correction of its bid price, pursuant to Tender Conditions; or

(c) if the bidder is determined, at any time prior to award of contract, to have engaged incorrupt, malpractice or fraudulent practices in competing for the contract; or

(d) In the case of a successful bidder, if it fails within the specified time limit to:

(i) Sign the Contract Agreement, or

(ii) Furnish the required contract performance security

vi. No interest shall be payable by the owner on the above bid security.

vii. MSEDCL will not entertain any request for adjusting the EMD from the bidder's due/running bills or from the EMD/Security Deposit of any other tender participated by the bidder.

viii. Offers received without Tender Fee and EMD are liable for rejection.

6.1 Confirmation on submission of documents & Mandatory requirements

A summary sheet confirming whether all documents/requirements have been met along with page reference to where in the Bid have compliance to these requirements which have been described / included should be furnished by the bidder (Refer Annexure - X):

6.2 Technical and Commercial Bid

This part of the bid consists of all the documents/ requirements except the price bid schedule Annexure – VI.

Note: submitting the bid to the e-tender website confirms compliance of all the commercial conditions by the bidder.

6.3 Price Bid

The Price Bid should be submitted as per (Annexure – VI).

The bid shall contain no erasures or overwriting, except to correct errors made by the Bidder, in which case the person or persons signing the bid shall initial such corrections. Price should be quoted in number & words. In case of discrepancy and or difference in the value between the Quoted price in Number and as expressed in words, lower of the two/beneficial to MSEDCL shall be considered .

7.0 GENERAL BID INSTRUCTIONS

7.1. Intent of Bid Specification

The intent of this bid specification is to enter into single contract covering completely the scope of work specified in the accompanied specification forming completely coordinated and engineered package, all in accordance with the specifications as detailed out in the various sections of this bid document. MSEDCL in order to implement the project will be entering into single responsibility contract with the successful bidder. Bids not covering the entire scope of work as detailed in the Bid Specification will be treated as non- responsive and hence rejected.

However, MSEDCL reserves the right to split the scope in any number of contracts or may award contract for partial scope of work.

7.2. Conflict of Interest

i. Each Bidder shall submit only **one bid** for each region. A bidder who submits or participates in more than one bid for same region will be disqualified.

ii. All bidders found to be in conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in a bidding process if they:

   a. Have controlling shareholders in common; or

   b. Receive or have received any direct or indirect subsidy from any of them; or

   c. have the same legal representative for purposes of a bid; or

   d. have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on a bid of another bidder, or influence the decisions of the Employer regarding the bidding process; or

   e. submit more than one bid for any particular contract package in the bidding process. This however does not limit the participation of subcontractors in more than one bid or as bidders in one bid and subcontractors in other bids simultaneously; or

   f. participated as a consultant in preparing the design or technical specifications of the goods and related services or works that are the subject of a bid.

For verification of conflict of interest, a copy of Articles of Association & Memorandum of Association in case of company & in case of partnership firm, a copy of partnership deed is required to be submitted by bidders along with bid.

7.3. Compliance to MSEDCL Ethical Standards

MSEDCL attaches top most priority to adherence to the highest ethical standards in all its transactions and expects the same from all entities it enters into any relationship with.

Accordingly, it expects every Bidder to observe the highest standard of ethics and integrity during the bidding process and if successful, during all stages of the project. If a bidder is found to have indulged in any corrupt or fraudulent practice or in any practice which is not in conformity with the highest ethical standards, then the bid will stand rejected. In such a case, MSEDCL may even go to the extent of black-listing the bidder and barring it from responding to any future enquiries / tenders floated by it.

To ensure uniformity in understanding of corrupt and fraudulent practices between MSEDCL and the bidders, the same has been defined below:

a) The term 'corrupt practice' means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

b) The term 'fraudulent practice' means a misrepresentation of facts in order to influence procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

c) By signing the Bid Forwarding Letter, the Bidder represents that for the software & services it supplies, it is the owner of the Intellectual Property Rights. Willful misrepresentation of these facts shall be considered a fraudulent practice without prejudice to other remedies that the Purchaser may take.

7.4. Important Notes

The Bidder shall note the following:

i. Bid documents are not transferable.
ii. Not more than one bid for the work shall be submitted by one Bidder or one firm of Bidders.
iii. If the Bidder deliberately gives wrong information in his bid to create circumstances for the acceptance of its bid, the Owner reserves the right to reject such bid and/or cancel the order if placed.
iv. Bid documents submitted by the Bidder shall become the property of the Owner and the Owner shall have no obligation to return the same to the Bidder.
v. Bid must cover the entire scope of work (as a full package) as specified in this tender document.
vi. Bid covering partial scope of work shall not be acceptable.

7.5. Bidder to inform himself fully:

i. The Bidder shall make independent enquiry and satisfy himself as to all the required information, inputs, conditions and circumstances and factors which may have any effect on its bid price and also on the execution of work covered under these specifications and documents. In assessing the bid it is deemed that the Bidder has inspected and examined the site conditions and its surroundings, examined the laws and regulations in force in India, the transportation facilities available, the conditions of roads, bridges, ports, etc. for unloading and/or transporting heavy pieces of material and to have based its equipment size and fixed its price taking into account all such relevant conditions and also the risks, contingencies and other circumstances which may influence or affect the execution of the works as specified in these bid specification.

ii. In their own interest, the Bidders are requested to familiarize themselves with the Income Tax Act, the Companies Act, the Customs Act and all other related acts and laws prevalent in India. The Owner shall not entertain any request for clarifications from the Bidders regarding such local laws and the conditions. However, the owner shall direct the bidder from where to obtain such assistance provided the request for such assistance is received well in advance. However, non-receipt of such information shallot be a reason for the bidder to request for extension in opening date of the bid. The Bidder shall understand and agree that before submission of its bid all such factors, as generally brought out above, have been fully investigated and considered while submitting the bid. No claim for financial adjustment to the contract awarded under this specification and documents shall be entertained by the owner. The Owner shall also not permit any change in time schedule or any financial adjustment arising thereof which are based on lack of clear information for such site conditions, laws and regulations and other related information and/or its effect on the price quoted in the bid.

iii. Availability of Acts & Regulations: The various acts and regulations referred in these documents are normally available for sale on the following address:

Deputy controller, Public Department, Govt. of India, New Delhi, 110006, INDIA

OR

With leading authorized booksellers

7.6. Interpretation of Bid Documents

If any is in doubt as to the true meaning of any part of the bid document or scope of work to be executed, he shall at once submit a written request in English language for clarification or interpretation of the doubt in question. Such request should reach the owner not later than 4 days prior to the date set for submission of the bids.

This written request shall be submitted in triplicate to MSEDCL on the following address:

Chief Engineer (MMD)
Maharashtra State Electricity Distribution Co. Ltd. "Prakashgad",
First Floor, Prof. Anant Kanekar Marg, Station Road, Bandra (East),
Mumbai 400 051 (INDIA)

Appropriate interpretation shall be given in the form of a supplementary notice which will updated on the website http://www.mahadiscom.in. MSEDCL shall respond to any request for clarification of the Bid Documents, which it receives not later than 4 days(four) prior to the deadline for submission of bids prescribed by MSEDCL. No oral or other interpretation shall be considered as binding on MSEDCL.

7.7. Amendment of Bidding Documents

i. At any time prior to the deadline for submission of bids, the Owner may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the bidding documents by amendment.

ii. The amendment shall be published on the website www.mahadiscom.in and shall be binding on the bidders.

iii. In order to afford prospective Bidders reasonable time in which to take the amendment into account in preparing their bids, the Owner may, at its discretion, extend the deadline for the submission of bids.

7.8. Cost Incurred in Responding to Tender

MSEDCL will not be responsible or liable for any costs being incurred by individual Bidders in preparing their response to this Tender nor will it be under any obligation to reimburse the same or any part thereof to any Bidder. Each Bidder must bear all costs being incurred by it in responding to this Tender. MSEDCL will also not be responsible for providing any facility or infrastructure to any bidder to facilitate it's preparation of its bid.

7.9. Language, Font Size etc.

The bid must be prepared in English language only. All supporting documents submitted as a part of bid must be in English language. Further, all communication with respect to the bid including any accompanying document, must be in English language only. Clarifications sought on the Tender Document must also be in English. While the Bidders are free to submit their response in color, the text in both the original and the copies of the Bid must be black in color, font of size not less than 10.

7.10. Bid Validity Period

All bids, not rejected for any other reason, will remain valid for a period of 180 days after the date of opening of the technical bid prescribed in the Tender Document or as communicated by MSEDCL. MSEDCL reserves the right to reject a bid which is not valid for the prescribed period of 180 days as non-responsive, without any explanation.

7.11. Extension of Period of Bid Validity

In exceptional circumstances, MSEDCL may request all the Bidders consent to an extension of the period of validity of their respective bid. The request and the response thereto will be made in writing. Extension of validity period by the Bidder must be unconditional. The bid

EMD provided in the form of BG will also have to be accordingly extended. A Bidder will have the right to refuse the request without forfeiting the bid security. A Bidder granting the request will not be permitted to modify his bid.

7.12. Date for Submission of the Bid

a) Deadline for Submission of Bid

The tender is to be submitted online on or before the due date and time for submission of the bid on the MSEDCL e-tendering website. It is advisable to submit the digitally signed bids sufficiently in advance of due date and time so as to avoid last minute trafficking at server. The prospective bidder should be well aware about the online submission of the bid. Any complaint for delay in submission of the bid due to any technical reason will not be entertained.

MSEDCL reserves the right to reject any or all tenders at our discretion without assigning any reason whatsoever.

b) Extension of Bid Submission deadline

MSEDCL may, at its sole discretion, decide to extend this deadline for submission of Bids. In such a case, all rights and obligations of MSEDCL and Bidders previously subject to the deadline will thereafter be subject to the new deadline.

c) Bids Received Late

As this is e-Tendering Process, the bidder will not be able to upload their bids after the expiry of due date & Time. Any bid received by MSEDCL after the expiry of the specified deadline for submission of bids will be considered as rejected. The Bidders must take all responsibility of submitting the Bids within the prescribed deadline. MSEDCL will not accept any excuse of non-receipt / non- delivery/non-uploading of the Bids.

8.0 EVALUATION OF BID/AWARD OF CONTRACT

8.1 Opening of Bids

MSEDCL shall open the bids at its office located at the address mentioned below:

Chief Engineer (MMD)
Maharashtra State Electricity Distribution Co. Ltd. "Prakashgad",
First Floor, Prof. Anant Kanekar Marg, Station Road, Bandra (East),
Mumbai 400 051 (INDIA)

If any change is there in address the same will be informed to bidder well in advance. Bids received before the dead line of the submission of the bid will be opened on the date and time of opening as indicated in Invitation for Bid. Bidder may view the Bid Opening Online on thee-Tendering Website. Bidders wishing to be present at the time of such opening may send their duly authorized representative. Maximum of 2 persons per bidder shall attend. Their signatures shall be obtained in a register evidencing their presence at the time of opening & certifying that all bids submitted were opened.

The bids shall be opened in the following sequence:

1. The Tender Fee & EMD is verified first. The bids of those bidders who have not paid the Tender fee or EMD will not be opened and evaluated further.
2. The Technical bid will be opened online on e-tendering website on due date.
3. Price Bid will be opened in online on e-tendering website after completion of the Evaluation process of Technical Bid and the date & time will be informed to the technically qualified bidders in advance.

During the process of technical evaluation, MSEDCL may require the technical presentation / demonstration of complete AMI system with all use cases from the bidders which would also be the part of evaluation. If the MSEDCL is not satisfied with the proposed solution of the Bidder, then MSEDCL reserves the unconditional & undisputed rights to disqualify the Bidder from Tendering Process.

The purchaser will open the Price Bids (as defined in Tender Clause) of only those Bidders who qualify in technical bid evaluation. The date, time and place for opening the Price Bids will be communicated to the technically qualified bidders. The Bidders may attend the opening or view the Bid Opening Online on the e-Tendering Website.

Bids or modifications thereto may be rejected if they are not addressed as prescribed in the Tender Document. Bids may be rejected outright if it is not accompanied by the prescribed Bid security. Bids rejected during the bid opening phase will not be considered for further evaluation.

MSEDCL may at its sole discretion, seek clarification from the bidders to assist in the evaluation, comparison and an examination of bids. The request for clarification and the response will be in writing. If the response to the clarification is not received before the expiration of deadline prescribed in the request, MSEDCL reserves the right to make its own reasonable assumptions at the risk and cost of the Bidder.

8.2 Deviations

No deviation to this tender document is allowed. The bidder has to submit the Annexure – VII **'No Deviation Form"**.

8.3 Alternative Offer

No alternative offer will be accepted.

8.4 Preliminary Examination of Bids

The Purchaser will examine the bids to determine whether they are complete, whether any computational errors have been made, whether required securities (EMD amount) have been furnished, whether the documents have been properly signed, and whether the bids are generally in order. The Purchaser will ensure that each bid is from an eligible Bidder.

Arithmetical errors will be rectified on the following basis.

If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity, or between subtotals and the total price, the unit or subtotal price shall prevail, and the total price shall be corrected.

If there is a discrepancy between words and figures, lower of the two/beneficial to the MSEDCL shall be considered. If a Bidder does not accept the correction of errors, its bid will be rejected and its bid security (EMD) may be forfeited.

The Purchaser may waive any minor nonconformity, or irregularity in a bid that does not constitute a material deviation, provided such waiver does not prejudice or affect the relative ranking of any Bidder.

Prior to the detailed evaluation, the Purchaser will determine whether each bid is complete, and is substantially responsive to the Bidding Documents. For the purposes of this determination, a substantially responsive bid is one that conforms to all the terms, conditions, and specifications of the Bidding Documents without material deviations, exceptions, objections, conditionality or reservations. A material deviation, exception, objection, conditionality, or reservation is:

1. One that limits in any substantial way the scope, schedule, quality, or performance of the desired contract; or
2. One that limits, in any substantial way that is inconsistent with the Bidding Documents, the Purchaser rights or the successful Bidder's obligations under the Contract; and
3. Acceptance of which would unfairly affect the competitive position of other Bidders who have submitted substantially responsive bids.

If a bid is not substantially responsive, it will be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the nonconformity. The Purchaser's determination of bid responsiveness will be based only on the contents of the bid submitted.

8.5 Evaluation and Comparison of Bids

The evaluation of responsive bids shall be done in 2 stages:

a) STAGE-I: RESPONSE TO QUALIFYING REQUIREMENTS

These are mandatory requirements to be met by the Bidder. Only those bidders who meet all the mandatory requirements, sample testing & successful demonstration of complete AMI solution for all use cases as provided in this document shall be considered for stage II evaluation.

b) STAGE – II: EVALUATION OF THE PRICE BID

Bidders who qualify in the Stage I of evaluation will be considered for stage II evaluation and Price Bids will be opened only for these bidders.

The lowest bid (L-1) will be arrived by considering the package cost of (A)+(B)+(C)+(D) of Annexure-VI and the bidder whose bid is lowest, will be considered as successful bidder L-1 bidder i.e. L-1 will be arrived as per package cost. All bidders who have qualified in Stage II evaluation and have quoted within range of 5% or above 5% in comparison with the lowest rate may be asked to match the lowest (L-1) rate.

After matching with L-1 rate, matching bidders may be awarded remaining quantity /towns at MSEDCLs discretion in order to fulfil the scope of tender.

8.6 Contacting the Purchaser

i. From the time of bid opening to the time of Contract award, if any Bidder wishes to contact the Purchaser on any matter related to the bid, he shall do so in writing.

ii. If a Bidder tries to influence the Purchaser directly or otherwise, interfere in the bid evaluation process and the Contract award decision, his bid will be rejected.

8.7 Purchaser's Right to Accept or Reject Any or All Bids

i. The Purchaser reserves the right to accept or reject any bid or to annul the bidding process and reject all bids at any time prior to Contract award, without thereby incurring any liability to the Bidders.

ii. The Purchaser reserves the right to negotiate with the Bidder who becomes eligible for award of the contract as per Tender conditions.

iii. MSEDCL reserves the right to reject any or all the price bids or Tender at its own discretion without assigning any reason whatsoever.

8.8 Notification of Award

i. Notwithstanding anything contained in this document, MSEDCL reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders the grounds for the MSEDCL's action.

ii. Subject to above clause, the owner shall award the contract to the successful bidder whose bid has been determined to be substantially responsive and has been determined as the lowest evaluated bid provided further that the bidder is assessed to be qualified to satisfactorily perform the contract.

iii. Notification of award of contract shall be made in writing through a 'Notice of Award', i.e. Letter of Award to the successful Bidder. This letter of award may be in writing by registered letter or by cable or FAX, to be confirmed in writing by registered letter or courier service or by speed post that its bid has been accepted.

iv. Till such time the formal contract is signed, the letter of award issued by the owner to the successful bidder and its acceptance by the bidder shall be construed as a contract document and conditions of contract contained in these documents shall become applicable.

8.9 Signing Of Contract

i. The successful bidder after submission of contract performance guarantee and its acceptance by the owner shall have to sign contract agreement with the Owner within fourteen (14) calendar days from the date of Letter of Award. This agreement shall be signed at the office of the owner in Mumbai on a date and time to be jointly decided.

ii. The contractor shall send one copy of the final draft agreement to the Owner for his scrutiny and approval within fourteen days (14) of issue of letter of award by the Owner. The contractor shall sign the Form of Contract Agreement on a Rs. 500/- Stamp Paper (non-judicial) issued in Maharashtra and returns it to Owner.

iii. The Contractor shall provide, before signing of the contract, appropriate power of Attorney and other requisite materials. The contractor shall provide free of cost to the Owner all the engineering data, drawings and descriptive materials submitted with the Bid, in at least six (6) copies to form a part of the contract, immediately after issue of Letter of Award accepting the bid.

iv. All charges for preparing the contract documents including legal fee, stamp fee etc. shall be borne by the successful Bidder. The contract shall be signed in two original. One to be retained by the owner and one by the bidder. After signing of the contract, the contractor shall furnish to the owner 3 true copies of the signed contract agreement duly bound.

v. If the successful Bidder fails to sign the contract, the same shall constitute sufficient ground for the annulment of the award of work and also the forfeiture of contract performance guarantee/security, in which event the owner may make the award to the next lowest evaluated responsive bidder or call for new bids.

vi. All the conditions given in this document shall form the part of the contract. Based on the information submitted by the bidder in response to the instruction to bidder additional clauses may also have to be incorporated and shall be mutually agreed to.

8.10 Contract Performance Security

i. The successful bidder shall provide to the owner within fourteen (14) days of issue of letter of intent, the contract performance guarantee as per the provisions of the clause mentioned in this document.

ii. The contract performance security shall be denominated solely in Indian Rupees, and shall be in the form of an unconditional and irrevocable Bank Guarantee issued by a Nationalized or Scheduled Bank.

8.11 Check List

i. The bidders are requested to go through carefully the instructions for preparation of their bids. Conditions elaborated in "General Conditions of Contract" and "Special Conditions of the Contract" may be borne in mind while bid preparation. The bid shall fully meet the technical requirement specified in this tender document.

ii. The bidders may depute their representative to visit the site to get any additional information and to check the site conditions personally.

iii. The bidder may submit additional information, which in his opinion shall help the owner to evaluate the bid. Bidder shall use continuation sheets wherever necessary.

iv. The Bidders are requested to duly fill in the check list enclosed with Bid (Annexure – X). This check list gives only certain important items, to facilitate the bidder to make sure that the necessary data/information is provided by the Bidder in its proposal. This, however, does not relieve the bidder of its responsibility to make sure that his proposal is otherwise complete in all respects.

8.12 Debarring / Blacklisting of Agency:

In the event of fraudulent practices / non-compliance / non fulfilment of any obligation as required by MSEDCL at any stage of tendering or execution, the bidder is liable to be debarred / blacklisted at the discretion of MSEDCL.

GENERAL CONDITIONS OF CONTRACT

9.1 DEFINITIONS

Definitions: In the contract (as hereinafter defined) the following words and expressions shall have meaning hereby assigned to them except where the context otherwise requires.

i. "EMPLOYER" or "Owner" or "Purchaser" or "Principal" or "MSEDCL" means Maharashtra State Electricity Company Limited having its Registered Office at Prakashgad, Bandra (East), Mumbai 400051 and includes Employer's representatives or successors or assigns. Employer's representatives include "Project Manager".

ii. "Project Manager" or "Project Coordinator" means the person appointed by MSEDCL in the manner provided in Tender to perform the duties delegated by MSEDCL.

iii. "Manager" means any assistant of the Project Manager or any other employee or agent appointed from time to time by the EMPLOYER or the Project Manager to perform the duties related to this contract.

iv. 'Site' shall mean the locations and places wherever business activities are conducted by the EMPLOYER.

v. "Contractor" or "Supplier" or "Vendor" or "Bidder" or "AMISP" or "System Integrator" (SI) shall mean whose tender has been accepted and shall include his/her/its/their heirs, executors, administrators, legal representatives/ successors/assigns and his/her/its/their Indian Agents approved by the EMPLOYER. SI/Bidder can be a company or a corporation and is the agency who provides all necessary services for the successful implementation of the project deliverables. SI/Bidder must be a single entity. No Consortium shall be allowed.

vi. "Party" means the Owner or the Vendor, as the case may be and parties mean both of them.

vii. "Successful Bidder" Successful Bidder means, the bidders whose bid has been accepted meeting MSEDCL's requirement in all respects and stands Lowest among acceptable bids.

viii. "Contract" or "Work Contract" or "Work Order" means invitation to tender, instructions to Bidders, tender with all the enclosures thereto, articles of agreement, General conditions of Contract, Special conditions of Contract, specifications, price schedule, diagrams / drawings together with the letter of intent / contract itself (Work Order / Purchase Order) and other documents and correspondence specifically indicated therein.

ix. "Scope" means "Scope of product vendor, Implementation Partner & service provider as covered in Section II" of this document, which forms part of these documents

x. "GCC" means General Conditions of Contract and "SCC" means Special Conditions of Contract which form part of these documents

xi. "Tender Specification" shall mean the GCC, SCC, SCOPE as mentioned at Section 2, Instructions to Bidders read with notice to inviting tender and subsequent clarification if any furnished by the EMPLOYER for the purpose of submitting the offer by the Bidder.

xii. "CC" means the Conditions of Contract.

xiii. "SUPPLY, INSTALLATION& FMS ACTIVITY" covers the entire scope of this tender document.

xiv. "Schedule" or "Work Schedule" shall mean the accepted schedules between the Bidder and the EMPLOYER forming part of the contract.

xv. "Letter of Intent (LOI)/ Notice of award/ Letter of Award (LOA)" means intimation from the EMPLOYER by a letter / fax / email to the Bidder that his tender has been accepted in accordance with the provisions contained in that letter / fax / email.

xvi. "Contract Price" means the sum indicated in the LOI subject to such additions thereto or deductions there from as may be made under the Provisions hereinafter contained

xvii. "Date of award of contract" shall mean the date of issue of Letter of Intent or the date of issue of acceptance of tender or date of contract whichever is earlier.

xviii. "Approval of the EMPLOYER" shall mean the written approval by the EMPLOYER or his authorized representative of a document, a diagram / drawing or other particulars of matters in relation to the contract.

xix. Words importing persons shall include firms, companies, corporations, associations or body of individuals whether incorporated or not. Words importing masculine gender or singular number shall also include the feminine gender and plural number and vice-versa where the contract so requires or permits.

xx. The contract and all correspondence between the EMPLOYER and the Bidder shall be in English language.

xxi. 'In charge" of Bidder is a person from the Implementation Partner/System Integrator appointed by Bidder. He will be deemed as authorized agent of the Bidder.

xxii. The headings to various clauses of this contract shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof of the contract.

xxiii. "Technical Requirements" mean the requirements mentioned & referred in the Scope of Work given in Section II.

xxiv. "Implementation Schedule" means the Implementation Schedule documented in the Agreed and Finalized Project Plan.

xxv. "Bidding Documents" refers to the collection of documents issued by the MSEDCL to instruct and inform bidders of the processes for bidding, selection of the winning bid, and Contract formation, as well as the Contractual conditions governing the relationship between the MSEDCL and the Bidder .

xxvi. Bidder's Representative" means any person nominated by the Bidder and named as such in the Contract Agreement and approved by the MSEDCL in the manner provided Tender (Bidder 's Representative) to perform the duties delegated by the Bidder .

xxvii. "System" or "Subsystem" means any application component, developed application or module to meet the technical requirements that may be supplied, installed, tested, and commissioned individually before Commissioning of the entire contract.

xxviii. "Services" means all technical, logistics, management, and any other Services to be provided by the Bidder under the Contract to supply/ develop, install, implement, customize, integrate, and make operational the proposed project. Such Services may include, but are not restricted to Installation, Commissioning, Go-Live, testing and Training.

xxix. "The Project Plan" means the document to be developed by the Bidder and approved by MSEDCL based on the requirements of the Contract and the Development and Implementation Plan included in the bid. For the sake of clarity, "the Agreed and Finalized Project Plan" refers to the version of the Project Plan approved by the MSEDCL. The project plan may be changed/ modified during the course of the project. Should the Project Plan conflict with the Contract in any way, the relevant provisions of the Contract, including any amendments, shall prevail.

xxx. "Materials" means all the deliverables as per the agreement to be provided to MSEDCL under the Contract.

xxxi. "Intellectual Property Rights" means any and all copyright, moral rights, trademark, patent, and other intellectual and proprietary rights, title and interests worldwide, whether vested, contingent or future including without limitation all economic rights and all exclusive rights

to reproduce, fix, adapt, modify, translate, create derivative works from, extract or re-utilize data from, manufacture, introduce into circulation, publish, distribute, sell, license, sublicense, transfer, rent, lease, transmit or provide access electronically, broadcast, display, enter into computer memory, or otherwise use any portion or copy, in whole or in part, in any form, directly or indirectly, or to authorize or assign others to do so.

xxxii. "Offered Product for evaluation purposes" means the product offered by the vendor or its version predecessors.

xxxiii. "Delivery" means delivery of different items at employer's site as per the scope given in Tender.

xxxiv. "Installation" means that the System or a Subsystem installed on the hardware and made available for Commissioning as provided in Tender.

xxxv. "Day" means calendar day of the Gregorian calendar.

xxxvi. "Week" means seven (7) consecutive Days, beginning the day of the week as is customary in the India.

xxxvii. "Month" means calendar month of the Gregorian calendar.

xxxviii. "Year" means a period of twelve (12) consecutive Months.

xxxix. "Effective Date/ Kick-off Date" means the date of signing of the Contract Agreement, for the purpose of determining the Delivery, Installation, and Acceptance dates for the contract.

xl. "Contract Period" is the time period during which this Contract governs the relations and obligations of the MSEDCL and Bidder in relation to the contract.

9.2 NOTICES

Any notice, request or consent required or permission to be given or made pursuant to this contract shall be in writing. Any such notice, request or consent shall be deemed to this contract shall be in writing. Any such notice, request or consent shall be deemed to have been given or made when delivered in person addressed to an authorized representative of the party with whom the communication is, or were sent by registered mail, telex, telegram or facsimile to such Party at the address specified in the clause of submission of proposal.

9.3 INTERPRETATION

i. Language: All Contract Documents, all correspondence, and communications to be given shall be in English and the Contract shall be construed and interpreted in accordance with that language.

ii. If any of the Contract Documents, correspondence, or communications are prepared in any language other than English, the translation of such documents, correspondence, or communications shall prevail in matters of interpretation. The originating party, with respect to such documents, correspondence, and communications, shall bear the costs and risks of such translation.

iii. Headings: The headings and marginal notes in the CC are included for easy reference and shall neither constitute a part of the Contract nor affect its interpretation.

iv. Persons: Words importing persons or parties shall include firms, corporations, and government entities.

v. Entire Agreement: The Contract constitutes the entire agreement between the MSEDCL and Bidder with respect to the subject matter of Contract and supersedes all communications, negotiations, and agreements (whether written or oral) of parties with respect to the subject matter of the Contract made prior to the date of Contract.

vi. Amendment: No amendment or other variation of the Contract shall be effective unless it is in writing, is dated, expressly refers to the Contract, and is signed by a duly authorized

representative of each party to the Contract.

vii. Severability: If any provision or condition of the Contract is prohibited or rendered invalid or unenforceable such prohibition, invalidity, or unenforceability shall not affect the validity or enforceability of any other provisions and conditions of the Contract.

9.4 RELATIONSHIP AND LIMITED AUTHORITY

The Bidder shall not have, nor shall he represent himself as having, any authority to commit the Board to any contract, agreement, or other legal commitments in the name of or binding on the Board or to pledge or extend credit in the name of the Board. The Bidder shall perform the scope and services hereunder as an independent Bidder and not as an employee, agent, partner or joint venture partner of the Board.

9.5 OBLIGATIONS OF CONTRACT

i. GENERAL

Standard of Performance

The bidder shall always act, in respect of any matter relating to this Contract or to the Services, as faithful advisor to the Owner.

ii. CONFIDENTIALITY

The Bidder and their Personnel shall not, during the term and within two years after the expiration of this Contract, disclose any proprietary or confidential information relating to the Project, the services, this contract or the Owner's business or operations without the prior written consent of the Owner.

iii. DISCLOSURE

The Bidder shall agree that the MSEDCL has the right to fully disclose this contract and the identity of the Bidder, if such disclosure is required by legal authority or necessary to satisfy lender(s) information requests in support of GoM approval process etc.

iv. INDEMNITY

The Bidder assumes responsibility for and shall indemnify and save harmless to MSEDCL, from all liability, claims, costs, expenses, taxes and assessments including penalties, punitive damages, attorney's fees and court cost which are, or may be required with respect to any breach of the Bidder's obligations under the Contract, or for which the Bidder has assumed responsibility under the Contract, including those imposed under any contract, local or national and international law or laws, or in respect of all salaries, wages or other compensation of all persons employed by the Bidder in connection with performance of any work covered by the Contract. The Bidder shall execute and deliver such other further instruments to comply with all the requirements of such laws and regulations as may be necessary there under to confirm and effectuate the Contract and to protect to MSEDCL.

MSEDCL shall not be in any way held responsible for any accident or damages incurred or claims arising there from during discharge of the obligations by Bidder under this contract.

v. Liability of the Bidder

Subject to additional provision, if any, the Bidder's liability under this contract shall be as provided by the Applicable Law

vi. Bidder's actions requiring owner's prior approval

The Bidder shall obtain the Owner's prior approval in writing before taking any of the following actions:

i) Appointing or removing any member of the Personnel as are listed in their bid ("Bidder's

Key Personnel")

ii) Taking up a similar kind of project elsewhere during discharge of duties /obligations under this contract.

vii. Assignment And Subletting

The Bidder shall not transfer or sublet or assign the contract or any part thereof or any benefit or interest therein or there under. In the event of the Bidder contravening this condition, the EMPLOYER shall be entitled to place the contract elsewhere on the Bidder's account and at his risk and then the Bidder shall be liable for any loss or damage which the EMPLOYER may sustain in consequence or arising out of such replacing of contract.

viii. Patent Infringement

The Bidder shall protect, indemnify and save harmless MSEDCL, his customers and users of his products, against all liability, including cost, expenses, claims, suits or proceedings at law in equity or otherwise, growing out of or in connection with any actual or alleged patent infringement (including process patents, if any) or violation of any license and will defend or settle at the Bidder's own expense any such claims, suits or proceedings.

The MSEDCL will notify the Bidder in writing of any such claim, suit, action or proceeding coming to his attention, giving authority and all available information and assistance for the Bidder's defense of the same. The Bidder shall appoint a counsel at his own expenses in consultation with the MSEDCL to collaborate in the defense of any such claim, suit, action or proceeding.

ix. Reporting Obligations

The Bidder shall submit, to the Owner, the final project report along with the documents in the format as needed by the owner.

9.6 TERMINATION OF THE CONTRACT

Termination for Purchaser's Convenience: The Purchaser may at any time terminate the Contract for any reason by giving the Bidder a ninety days (90) notice of termination that refers to this Clause.

i. Upon receipt of the notice of termination under above Clause, the Bidder shall either as soon as reasonably practical or upon the date specified in the notice of termination cease all further work, except for such work as the Purchaser may specify in the notice of termination for the sole purpose of protecting that part of the contract already executed, or any work required to leave the site in a clean and safe condition. In addition, the Bidder, subject to the payment specified in below Clause, shall deliver to

a] The Purchaser the parts of the project executed by the Bidder upto the date of termination;

b] The extent legally possible, assign to the Purchaser all right, title, and benefit of the Bidder to the project , or Subsystem, as at the date of termination, and, as may be required by the Purchaser;

c] The Purchaser all non-proprietary drawings, specifications, and other documents prepared by the Bidder as of the date of termination in connection with the contract.

ii. In the event of termination of the Contract under above Clause, the Purchaser shall pay to the Bidder the payment for invoices submitted prior to the effective date of termination.

iii. Termination for Bidder's Default

A. The Purchaser, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefore to the Bidder, referring to this Clause.

a. If the Bidder becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Bidder members are corporation, a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation), a receiver is appointed over any part of its undertaking or assets, or if the Bidder takes or suffers any other analogous action in consequence of debt;

b. If the Bidder assigns or transfers the Contract or any right or interest therein in violation of the provision of Tender Clause (Assignment and subletting);

c. If the Bidder, in the judgment of the Purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, including but not limited to willful misrepresentation of facts concerning ownership of Intellectual Property Rights in, or proper authorization and/or licenses from the owner to offer, the hardware, software, or materials provided under this Contract;

d. If the Tenderer, before contract award, has committed a transgression through a violation of any of the terms under contract agreement or in any other form such as to put his reliability or credibility as Tenderer in to question, the Principal is entitled to disqualify the tenderer from the tender process or to terminate the contract, if already signed for such reason;

e. If the tenderer, after the Contract award has committed a transgression through a violation of any of the tender terms or in any other form such as to put his reliability or credibility as Tenderer in to question, the Principal is entitled also to exclude the Tenderer / Contractor from future contract process. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors within the company hierarchy of the Tenderer / Contractor and the amount of damage. The exclusion will be imposed for a minimum of 6 months and a maximum of 3 years.

B. If the Bidder:

a. Has abandoned or repudiated the Contract;

b. Has without valid reason failed to supply & installation and implementation of meter reading through MDAS in project area as per Milestone (Annexure – XI) submitted by the bidder.

c. Has failed to follow SLA.

d. Persistently fails to execute the Contract in accordance with the contract or persistently neglects to carry out its obligations under the Contract without just cause;

e. Refuses or is unable to provide sufficient Materials, Services, or labour to execute and complete the contract in the manner specified in the Agreed and Finalized Project Plan furnished at rates of progress that give reasonable assurance to the Purchaser that the Bidder will implement as above solution in given area, then, the Purchaser may, without prejudice to any other rights it may possess under the Contract, give a notice to the Bidder stating the nature of the default and requiring the Bidder to remedy the same. If the Bidder fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the Purchaser may terminate the Contract forthwith by giving a notice of termination to the Bidder that refers to this Clause.

f. Upon receipt of the notice of termination, the Bidder shall, either immediately or upon such date as is specified in the notice of termination:

a. Cease all further work, except for such work as the Purchaser may specify in the notice of termination for the sole purpose of protecting that part of the “contract already executed or any work required to leave the site in a clean and safe condition;

b. Deliver to the Purchaser the parts of the contract by the Bidder up to the date of termination, subject to the receipt of payment stated in clause.

c. To the extent legally possible, assign to the Purchaser all right, title and benefit of the Bidder to the contract or subsystems as at the date of termination, Contract.

d. Deliver to the Purchaser all drawings, specifications, and other documents prepared by the Bidder as at the date of termination in connection with the contract.

e. After termination of contract, infrastructure installed by the agency such as DCU, Gateways, data collection software etc. shall be handed over to MSEDCL. All hardware and software installed during the contract period will be treated as MSEDCL property.

iv. The Purchaser may enter upon the site, expel the Bidder, and complete the Contract itself or by employing any third party. Upon completion of the contract or at such earlier date as the Purchaser thinks appropriate, the Purchaser shall give notice to the Bidder that such Bidder's Equipment will be returned to the Bidder at or near the site and shall return such Bidder's Equipment to the Bidder in accordance with such notice. The Bidder shall thereafter without delay and at its cost remove or arrange removal of the Bidder's Equipment from the site.

9.7 FORCE MAJEURE

i. If at any time during the continuance of the Contract, the performance in whole or in part by either party or any obligations under the Contract shall be prevented or delayed by reason of any war, hostilities, act of public enemy, civil commotion, sabotage, fire, floods, explosions, epidemics, quarantine restrictions and Acts of God (hereinafter referred to as 'Events') and provided notice of the happening of any of the above mentioned Event duly certified by Indian Chamber of Commerce in case of Indian Parties or International Chamber of Commerce, Paris, France in case of foreign parties) is given by either party to the other within fifteen(15) days from the date of occurrence thereof, the MSEDCL shall have the right by reason of such Event to terminate the Contract without however affecting the right to any claim for damages on the Bidder in respect of such non-performance or delay in performance. However, in the event of the MSEDCL having agreed, the services under the Contract shall be resumed after such Event has come to end/ceases to exist. Should one or both the parties be prevented from fulfilling their contractual obligations by a state of force majeure lasting continuously for a period of at least 6 months and the MSEDCL not having terminated the Contract by that time, the two parties shall consult each other regarding the further implementation of the Contract with the provision that if no mutually satisfactory arrangement is arrived at within a period of 3 months from the expiry of 6 months referred to above, the Contract shall be deemed to have expired at the end of the 3 months referred to above. The above mentioned expiry of the Contract will imply that both the parties have obligations to reach an agreement regarding the winding up and financial settlement of the Contract.

ii. In addition to above, the situation arising because of theft of meters, meter burnt and damage at any time post commissioning during the continuance of the Contract will be covered under force majeure clause subject to due verification by MSEDCL.

9.8 FAIRNESS AND GOOD FAITH

i. Good Faith The parties undertake to act in good faith with respect to each other's rights under this contract and to adopt all reasonable measures to ensure the realization of the objectives of this contract.

ii. Operation of Contract

The parties recognize that it is impractical in this contract to provide for every contingency, which may arise during the life of this contract, and the parties hereby agree that it is their intention that this contract shall operate fairly as between them and without detriment to the interest of either of them.

9.9 SETTLEMENT OF DISPUTES

i. The decisions, opinions, directions, certificates of valuation of the MSEDCL with respect to all or any of the matters under Tender clauses and special conditions of contract for the decision of which specific provisions have been made here of, which matters here in referred to as "excepted matters" shall be final and conclusive and binding on the parties hereto shall be without appeal.

ii. Any notice to be given to the Bidder under the terms of these conditions shall be considered as duly served if the same shall have been delivered to, left for, or posted by registered post to the address of the Bidder at their registered office or address given in the tender. Similarly, any notice to be given to the MSEDCL shall be considered as duly served, if the same shall have been delivered to, left for, or posted by registered post to the MSEDCL'S office at Mumbai

iii. The Agreement shall in all respects be construed and carried into effect and rights and liabilities of the parties hereto shall be regulated according to the laws of India.

iv. Mutual Settlement of Disputes : Except where otherwise provided for in the contract, all questions and dispute relating to any matter directly or indirectly connected with this agreement shall in the first place be resolved through mutual discussions, negotiations, deliberation and consultations between both the parties.

v. Conciliation: If the effort to resolve all or any of the disputes through mutual settlement fails, such disputes shall be referred to the conciliator to be appointed by the mutual agreement of both the MSEDCL and the Bidder. The conciliator shall make the settlement agreement after the parties reach agreement and shall give an authenticated copy thereof to each of the parties. The settlement agreement shall be final and binding on the parties. The settlement agreement shall have the same status and effect of an arbitration award. The venue of Conciliation shall be Mumbai, Maharashtra, India.

vi. Arbitration: Any disputes, differences, whatsoever, arising between the parties out of or relating to the construction, meaning, scope, operation or effect of this Contract shall be settled between the MSEDCL and the Bidder amicably as mentioned in Tender. If however, MSEDCL and the Bidder are not able to resolve their disputes / differences amicably as aforesaid the said disputes / differences shall be settled by Arbitration. The Arbitration proceedings, in case of foreign Contractor shall be regulated and governed by the rules of Arbitration and Conciliation of International Chamber of Commerce, Paris. The venue shall be Mumbai, Maharashtra, India.

vii. The arbitration proceedings in case of Indian Contractor shall be regulated and governed by Arbitration and Conciliation Act, 1996 and the statutory modification thereof to the said act if any. Each party shall appoint its arbitrator; the two arbitrators so appointed shall appoint a third arbitrator who shall be the presiding arbitrator. The Arbitral Tribunal shall give a reasoned award. The award made in pursuance thereof shall be binding on the parties. The arbitration shall be governed and regulated in all respect according to Laws of India. The venue shall be Mumbai, Maharashtra, India.

viii. The further progress of any work under the contract shall unless otherwise directed by the MSEDCL continue during the arbitration proceedings and no payment due or payable by the MSEDCL shall be withheld on account of such proceedings. It shall not be open to arbitrator(s) to consider and decide whether or not such work shall continue during the arbitration proceedings.

ix. The courts at Mumbai, Maharashtra, India shall alone have jurisdiction and the applicable laws shall be the Laws of India.

10.0 SPECIAL CONDITIONS OF CONTRACT

Special Conditions of Contract (SCC) shall be read in conjunction with all the conditions specified in the General Conditions of Contract,, Instructions to tender read with notice inviting tender and any of their documents forming part of this tender where ever context so requires.

1: TENDER SAMPLE :

~~For testing of tender sample meters at one NABL Lab, and IT Section of MSEDCL tenderer are required to submit 10 (Ten) nos. of sample meters out of which one is without ultrasonic welding as per technical specifications for each type of meter. The bidders are requested to note that, if they like to offer different communication technology for same type of meter then they have to offer 10 sample meters for each type of communication. In case bidder opts for RF solution then the bidders have to submit 10 sample meters each for different makes of RF Modules used in sample meters.~~

~~Along with the sample meters, bidders required to submit connecting telephonic cable with connectors fixed to cable, API / Exe file with documentation and web based prepaid application prepaid engine, documentation, Exe / API for validating downloaded meter data, etc. of offered type / item in the office of the Chief Engineer, MSEDCL, Material Management Dept., 1st Floor, Prakashgad, Bandra (E), Mumbai – 400 051 on or before the time & date stipulated for submission of offer~~

~~Further the respective clauses of technical specification regarding sample submission of meter box are applicable.~~

Bidder has to give demonstration of complete AMI solution for all use cases as per clause No. 8.1 during technical evaluation.

~~**Packing of tender samples:**~~

~~"Sample meters shall be suitably packed in order to avoid damage during transit or handling. In case, the sample meters found damaged, it shall be the bidder's sole responsibility. Therefore, bidders should ensure that the meters packed are intact."~~

2: ORDER QUANTITY, DELIVERY SCHEDULE AND QUALITY TESTING

a] The L.O.A. will be issued for entire ordered quantity and same shall be considered as release order for entire quantity.

b] The sample meters drawn from first lot and subsequent lot shall be sent for type test to NABL lab for Quality Testing.

c] In case of failure of the sample meters in type tests (Quality Testing), then the balance ordered quantity shall stand cancelled & for the quantity already accepted against the order and used, deduction in price of 10% of the value of material supplied plus applicable taxes, if any shall be made.

3: GUARANTEE

For Meter:

"The meter shall be guaranteed for the period of 96 months from the date of commissioning or 102 months from the date of dispatch whichever is earlier".

4: CONTRACT PERFORMANCE DEPOSIT

The contract performance deposit shall be an amount equal to 5% of the contract value in the form of unconditional & irrevocable BG and to be submitted after the first consignment is effected and when the payment thereof becomes due to the contractor.

5: OFFER OF THE FIRM

The bidder has to quote for the entire quantity of particular region. The bidder may quote for all 4 (four) regions depending on its capacity. However, the award of contract to successful bidders for one or more region will be at sole discretion of MSEDCL.

6: OPERATION GO LIVE

Conditions to Be Met for Operational Go Live

The Operational Go Live of the AMI system shall be considered as completion of the successful integration of 10% of Smart Meters of a region (along with its related hardware and software equipment) supplied installed and integrated.

OTHER PARTICULARS

A. ROLE OF BIDDER

1. The Bidder has the overall responsibility as per the Scope mentioned in this document.
2. The Bidder shall be responsible for timely provision of all resources, information, and decision making under its control that are necessary to reach a mutually agreed and Finalized Project Plan as per delivery schedule of scope of work. Failure to provide such resources, information, and decision-making may constitute grounds for termination.
3. The Bidder shall acquire in its name all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings that are necessary for the performance of the Contract.
4. For any of the communication solution proposed by the bidder, selection of service provider will be responsibility of the bidder.
5. The Bidder shall comply with all laws in force in India. The laws will include all national, provincial, municipal, or other laws that affect the performance of the Contract and are binding upon the bidder. The Bidder shall indemnify and hold harmless the MSEDCL from and against any and all liabilities, damages, claims, fines, penalties, and expenses of whatever nature arising or resulting from the violation of such laws by the Bidder or its personnel, but without prejudice to Tender Conditions. The Bidder shall not indemnify the MSEDCL to the extent that such liability, damage, claims; fines, penalties, and expenses were caused or contributed to by a fault of the MSEDCL.
6. The Bidder shall provide the key personnel namely the Project Leader, Module Leaders, Quality Assurance personnel any Specialist/Analysts required as appropriate, need to have sufficient experience as per Tender Conditions in terms of relevance and number of years required to implement the project. Should the profile of any personnel be not acceptable to the MSEDCL will require the Bidder to suitably replace such personnel. They are to be assigned to the project on full time basis.
7. If for any reason beyond the control of the Bidder, there arises a need to replace any personnel, the Bidder shall provide a replacement person of equivalent or better qualification and experience, subject to the written approval of the MSEDCL.
8. Neither the Bidder nor its Personnel shall during the term of this Contract, engage in any business or professional activities in India/ Abroad which would conflict with the activities assigned to them under this Contract.
9. The Bidder is responsible for performing and safely storing, timely and regular backups of its data and Software in accordance with accepted data management principles, except where such responsibility is clearly assigned to the MSEDCL elsewhere in the Contract.
10. The Bidder will have primary responsibility for the successful running and stabilization in accordance with Tender Conditions.
11. In case project gets delayed due to any reason attributed to Bidder, no additional payment shall be done.

B. ROLE OF MSEDCL

1. The MSEDCL shall ensure the availability of all information and/or data to be supplied by the MSEDCL to the Bidder.
2. The MSEDCL will provide the monthly reading program to the implementing agency at the beginning of each month. Also MSEDCL will issue identity cards to staff of the bidder.
3. The MSEDCL will designate appropriate staff or the training courses to be given by the Bidder and shall endeavor to make all appropriate logistical arrangements for such training as specified in the tender, the Agreed and Finalized Project Plan, or other parts of the Contract.

C. PROJECT PLAN

1. In close cooperation with the MSEDCL and based on the Preliminary Project Plan included in the Bidder's bid, the Bidder shall develop a Project Plan encompassing the activities specified in the Contract.

2. The Bidder shall formally present to the MSEDCL the Project Plan in accordance with the Technical Requirements. The bidder has to specify the strategy and methodology with time frame and the synchronization of various phases of Project to ensure completion of Project in time. The Project plan shall also include a PERT chart describing the activities, resources required on the time for completion. The plan shall also bring out the critical areas needing continuous attention of the MSEDCL.

3. If required, the impact on the Implementation Schedule of modifications agreed during finalization of the Agreed and Finalized Project Plan shall be incorporated in the Contract by amendment, in accordance with Tender Conditions.

4. The Bidder shall undertake to supply, install energy meters and implement, integrate, commission AMR solution in accordance with the Agreed and Finalized Project Plan and the Contract.

5. The Progress and other reports specified shall be prepared by the Bidder and submitted to the MSEDCL in the format and frequency specified in the Agreed and Finalized Project Plan.

   Changes to the Project Plan, if required, shall be made with the mutual consent of the MSEDCL and the Bidder.

D. PRODUCT UPGRADES

1. At any point during performance of the Contract, shall technological advances be introduced by the Bidder for Subsystems originally offered by the Bidder in its bid and still to be delivered, the Bidder shall be obligated to offer to the MSEDCL the latest versions of the available Subsystem having equal or better performance or functionality at the same or lesser unit prices, pursuant to Tender Conditions.

2. During performance of the Contract, the Bidder shall offer to the MSEDCL all new versions, releases, and updates as well as related documentation and technical support services, within twenty eight (28) days of their availability from the Bidder to other clients of the Bidder in the MSEDCL's Country, and no later than twelve (12) months after they are released in the country of origin. In no case will the prices for this Software exceed those quoted by the Bidder in the Price Schedule form in its bid.

3. During the contract period the MSEDCL may require the Bidder to provide at no additional cost to the MSEDCL all new versions, releases within twenty eight (28) days of their availability from the Bidder to other clients of the Bidder in the MSEDCL's country, and no later than twelve (12) months after they are released in the country of origin of the Software.

4. The MSEDCL may at its discretion introduce all new versions, releases or updates of the Software provided that the new version, release, or update does not adversely affect the operation or performance. In cases where the new version, release, or update adversely affects the System operation or performance, or requires extensive reworking, the Bidder shall continue to support and maintain the version or release previously in operation for as long as necessary to allow introduction of the new version, release, or update. In no case shall the Bidder stop supporting or maintaining the version or release of the Software in operation, during the contract period. The MSEDCL shall use all reasonable endeavors to implement any new version, release, or update.

1. No unauthorized code: The Bidder shall not end any software that the MSEDCL is not licensed to use, unless the product is activated by a required license key. The Bidder shall also certify that all their products and updates as supplied to the MSEDCL shall be free from viruses, worms, Trojans, spy-ware etc.

E. GOVERNANCE LAW

1. This contract, its meaning and interpretation, and the relation between the Parties shall be governed by the Applicable Law. The laws applicable to this contract shall be the laws in force in India. The courts of Mumbai, India shall have exclusive jurisdiction in all matters arising under and on account of this contract.

F. GENERAL

1. There shall be no suspension of work on account of arbitration provided that the obligations of the MSEDCL and bidder shall not be altered by reasons of arbitration being conducted during the progress of Works. Neither party shall be entitled to suspend the work to which the dispute relates on account of arbitration.
2. The cost of arbitration shall be borne by the Implementation partner. The cost shall inter-alia include the fees of the arbitration(s) as per the rates fixed by the arbitrator from time to time.
3. The parties agree to comply with the awards resulting from arbitration and waive their rights to any form of appeal insofar as such waiver can validly be made.

G. INSURANCE

The insurance as per GoM guidelines and safety of all men and material of the Bidder at the MSEDCL's site shall be the responsibility of the Bidder. The Bidder, at his cost shall arrange, secure and maintain insurance as may be necessary and for all such amounts to protect his interests and the interests of the Owner against all risks.

H. BID SECURITY

The bid security of the successful bidder will be returned when the bidder has signed the Contract Agreement and furnished the required performance guarantee. The bid security of the unsuccessful bidders will be returned as promptly as possible, afterward and signing of the Contract Agreement or expiration of the period of bid validity, whichever is earlier.

I. PERFORMANCE GUARANTEE/SECURITY DEPOSIT

Within 14 (fourteen) days of receipt of the Letter of Award from the MSEDCL, the successful bidder shall furnish to the MSEDCL a Performance Bank Guarantee Bond for proper performance of the Contract as well as satisfactory performance of operational support, Product & Implementation to an amount not less than Five Percent (5%) of the Contract Price in accordance with the Conditions of Contract. The form of performance guarantee is provided in Annexure – IV (B) of the bidding documents may be used or some other form acceptable to the MSEDCL. The performance guarantee shall be denominated solely in Indian Rupees, and shall be in the form of an unconditional and irrevocable Bank Guarantee issued by a Nationalized or Scheduled Bank. The bank guarantee shall, if invoked, be encashable when presented in the branch office of such Bank located in Mumbai, Maharashtra.

1. Failure of the successful bidder to comply with the requirements Tender Conditions shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.
2. The Performance Bank Guarantee shall be returned to the bidder after successful completion of the entire work to the fullest satisfaction of the MSEDCL at the end of the contract period that is after the defect liability period.
3. The successful bidder is required to fulfill requirement of Product & Implementation as per criteria defined in this document, for a period of five years from the date of start of project.
4. If required the amount and validity of additional Bank Guarantee/s in case of any changes necessitated to be submitted by the successful bidder shall be calculated by the MSEDCL on the basis of details to be provided by the successful bidder. The successful bidder has to submit the fresh performance guarantee two months prior to completion of work. In case the contractor fails to submit the information and fresh Performance Guarantee, the retention amount available with the MSEDCL will be withheld & it will be released only after submission of the required Performance Guarantee, by the successful bidder.

5. If Bidder or their employees damage, break, deface the property belonging to the EMPLOYER or others during the execution of the contract, the same shall be made good by the Bidder at his own expense and in default thereof; the MSEDCL may cause the same to be made good by other agencies and recover expenses from the Bidder for which the certificate of the MSEDCL shall be final.

J. FORFEITURE OF PERFORMANCE BANK GUARANTEE

a. Whenever any claim against the Bidder for the payment of a sum of money arises out of or under the contract, the EMPLOYER shall be entitled to recover such sum by encashing in part or whole the P.B.G. Bond submitted by the Bidder . In the event of the P.B.G. Bond being insufficient or if no other security has been taken from the Bidder, then the balance or the total sum recoverable as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due to the Bidder. The Bidder shall pay to MSEDCL on demand any balance remaining due.

b. In the event of any breach by the Bidder or any loss or damage occasioned by MSEDCL which in the opinion of MSEDCL has arisen, the decision where of shall be final and binding on the Bidder or in the event of the termination of the contract for any such breach, the P.B.G. Bond is liable to be forfeited. The decision of forfeiture by MSEDCL shall be final and binding on the Bidder.

K. PRICES

1. The Bidder should submit their prices as per enclosed price bid format at Annexure – VI.
2. The Price quoted by the Bidder shall remain firm and binding during the Contract Period subject to the variations stipulated hereinafter. The break-up of Price with respect to the supply/service and the respective quantities for successful implementation shall be considered as indicative. The Bidder shall perform all his works as envisaged in the Agreement.
3. If the actual physical supplies and services are found more than those indicated by the Bidder in the Price Schedule, the Bidder shall not be entitled for any additional amount from MSEDCL. However in the event of decrease in actual supplies/services, the Contract Price shall be adjusted for the decreased supplies/services.
4. Unless specified otherwise in MSEDCL's Requirements, the prices to be quoted are intended to provide for all work duly and properly completed in accordance with the General Conditions of Contract and Special Conditions of Contract.
5. All payments shall be made directly to the bidder on necessary certification by the Bidder and on compliance of contractual terms & conditions. No Letter of Credit is envisaged for Rupee payment.
6. In case of shortage/missing/damage/ failure of any product identified at any point of time within the period specified by the Contract including guarantee period, the agency shall supply/replace the same without any financial implication to MSEDCL. The taxes, duties, clearing & forwarding and other charges incurred by MSEDCL in this regard shall be recovered from the Bidder's pending bills and in case no bills are pending the same shall be made good by the Bidder. The Bidder shall accordingly submit the subsequent invoices.
7. The bidder shall stand guarantee for the overall performance of the contract including for the supplies made/work done and work to be done by their Bidder members. Towards this guarantee, the Bidder shall submit a performance BG/security deposit for 5% of the Contract Price as per tender Conditions.
8. Considering the progress of the works and in order to meet the Contract Schedule, the Contractor shall carry out the works on round the clock if required, duly complying the statutory and site requirements.
9. Any other activity necessary for the completion of the supply, installation, tests & commissioning up to guarantee period as per General Conditions of Contract, Special Conditions of Contract if any, and Specifications.

10. All procedures required under statutes, for availing any concessions under relevant tax laws shall be adhered to by the Contractor.

1. The bidder shall note that the prices quoted shall include all the items and services listed at Annexure - VI (Price bid format)

L. TAXES & DUTIES

The quoted prices should be 'FIRM' inclusive of all of Govt. Statutory / levis / taxes & duties as applicable.

1. The estimated cost of GST chargeable to MSEDCL by the Contractor, wherever applicable, shall be shown separately in the Bidder's quotation,

2. The bidder should also note that MSEDCL will discharge its tax liability under the most beneficial scheme for availing the maximum cost advantage. Bidder should therefore take any GST to which they may be legally entitled into consideration while offering their quoted rates / prices.

3. Upward variation in GST if any applicable after opening of price bid/revised price/revision in price as the case may be (based on which the order on contract shall be placed) shall be reimbursed by MSEDCL subject to production of necessary documents by the Bidder. Similarly withdrawal/downward revision in variation in GST shall be adjusted in the price quoted and benefit shall be passed to MSEDCL. Variation of GST shall be reimbursed and no other variation shall be considered. Fresh taxes & levies, if any, as may be applicable on this contract, shall be reimbursable against documentary proof to be submitted by the Bidder. The bidder has to consider all taxes & duties applicable on this contract. Any omission, or non- inclusion, either declared or not declared, of any taxes and duties that are applicable at the time of submission of price bid/revised price bid /revision in prices shall not be considered as a reason for reimbursement of such taxes and duties at a later date.

4. During tenure of the contract if any new taxes/duties/levies etc. are imposed or rates undergo changes, as notified by the Government and become applicable to the subject works, the same shall be reimbursed by MSEDCL on production of documentary evidence in respect of payment of the same. Similarly, benefits accruing to agency on account of withdrawal/reduction in any existing taxes and duties shall be passed on to MSEDCL.

5. Variation in GST after opening the Price Schedule and/or revised Price Schedule as the case may be (based on which the order on Contract shall be placed) shall be reimbursed by MSEDCL subject to production of necessary documentary evidence by the Contractor at the time of submission of bill. Similarly withdrawal/ downward revision in GST shall be adjusted in the price quoted and benefit shall be passed to Employer. However if the Work is delayed for the reasons attributable to MSEDCL and extension of the Time for Completion is granted, variation in Taxes and Duties enacted during Contractual completion/execution period, the adjustment in contract price shall be allowed within the extended period of the Contract. Similarly, if the Work is delayed for the reasons attributable to the Contractor, variations in Taxes and Duties will not be paid.

6. The Contractor shall bear and pay all the liabilities in respect of non-observance of all legal requirements as per various statutory provisions.

7. The adjustment in the Contract Price towards imposition of new taxes or abrogation of existing taxes shall be applicable only if the new tax is enacted or existing tax is abrogated within Contractual delivery/execution period. For any variation due to enactment of new tax or abrogation of existing tax after Contractual delivery / execution period, adjustment in the Contract Price shall not apply.

8. All formalities required under statutes, for availing any concessions under relevant tax laws shall be adhered to by the Bidder.

M. DEDUCTION OF TAXES AT SOURCES

1. Recovery at source towards income tax calculated at the rate prescribed from time to time under the Income Tax Act 1961 and other relevant sections of Income Tax Act shall be made from the bills of the Bidder and the amount so recovered shall be deposited with the Income Tax Department. Necessary TDS certificate to this effect will be issued to the Bidder in the prescribed pro-forma.
2. If any other taxes / duties are to be recovered at source as per government regulations from time to time the same shall be recovered from the bills payable to the Bidder. Necessary receipt to this effect will be issued to the Bidder in this regard.

N. LIQUIDATED DAMAGES :

1. The Bidder shall stand guarantee for the performance and output as envisaged in the tender specification
2. In case of a delay in the deliverables (milestones as per below table) within the period stipulated in the agreement, the Bidder shall be liable to pay, at the discretion of the competent authority of MSEDCL, the liquidated damages to MSEDCL up to ½ % + GST if applicable per week or part of week on the price, subject to a maximum ceiling of 10% reckoned on the total contract value. Due consideration may be given in the levy of liquidated damages for reasons absolutely beyond the control of the Bidder, for which documentary evidence shall be produced to the satisfaction of the competent authority of MSEDCL. The decision of MSEDCL undersigned shall be final and binding on Bidder.

   At any time after the placement of this order if the Bidder fails to fulfill the obligations arising out of this order MSEDCL will have the right to get the work done from any other agency for completing the remaining work at Bidder's risk & cost.

O. TRANSFER OF OWNERSHIP

Ownership and the terms of usage of the Software and hardware, infrastructure and Materials supplied under the Contract shall be governed by Tender Conditions. After the contract period is over, infrastructure installed by the bidder such as data collection software, etc. shall be handed over to MSEDCL. The entire infrastructure installed during contract period, should be in good working condition while handing over to MSEDCL. All the hardware and software installed during the contract period shall be treated as MSEDCL property. The vendor shall grant the purchaser a perpetual license to use the software without any additional payment or obligations to enter into a contract for maintenance or support.

P. BILLING AND PAYMENT TERMS

All payments including installation charges will be effective only after Operation Go-Live in the following sequence:-

(a) Monthly Payment against Meters :

(i) 30% of the meter cost after supply, installation & Go-Live.
- Payment will be made through RTGS/NEFT within 15 days from the date of receipt of invoice / bill.

(ii) Balance 70% of the meter cost will be paid in 90 months in monthly mode.
- Payment will be made through RTGS/NEFT within 15 days from the date of receipt of invoice / bill.

(b) Monthly Payment against Installation :

(i) 100% payment towards installation of smart meter for the installed quantity shall be made after successful Installation & uploading the data on billing system with 1st billing reading of consumer after confirmation of receipt of data through MDAS.
- Will be paid through RTGS/NEFT within 15 days after 1st billing reading of consumer after confirmation as above.

(ii) Payment towards installation cost of Head End System/cloud/MDM inclusive of required licenses for OS, Database etc. shall be made in proportion to the meters installed during the contractual period of installation and subsequent confirmation from IT section, Corporate Office, Mumbai.
- Will be paid through RTGS/NEFT within 15 days after confirmation as above.

(c) Monthly Payment for FMS / Reading through AMR:

Monthly 100% payment towards consumers meter reading actually received in MSEDCL MDAS system (FMS) during the FMS duration of 90 months will be made after confirmation of receipt of monthly data through MDAS on fulfillment of below.

i. The Bidder shall submit monthly invoice as per agreed payment terms with supporting documents. All the deliverables completed and eligible for payment can be included. Payments will be made within 7 working days through RTGS only after submission of the bills and other documents which are correct in all respects for on account bills to the MSEDCL and as per availability of funds. Payment shall be released on submission of the bill with supporting documents and after deducting applicable taxes, penalty and other recoverable. Against deduction of statutory taxes, tax deduction certificates where ever applicable shall be issued at the end of the month.

ii. FMS / Billing by the agency shall be done, purely on per reading basis only i.e. for no. of Meter readings downloaded through AMR. Taxes applicable, if any, such as GST or any other tax applicable from time to time shall be paid extra.

iii. No separate charges will be paid to agency for integration of data collection software with MSEDCL central server i.e. MDAS

iv. In case of non-receipt of readings through AMR, readings should be downloaded through optical port through MRI/HHT. The HHT/MRI reading instrument should be arranged by the bidder at their own cost.

v. Penalty is applicable for readings not received through AMR within reading program as per annexure-VIII for SLA.

vi. The bidder shall submit the duly signed, circle wise monthly invoices in triplicate along with reading statistics for readings of meters through AMR, at the end of each month to General Manager (F&A-SB), Prakashgad, Mumbai. The invoices submitted will be processed on the basis of meter reading available in the web based data collection software of the bidder.

Q. WAIVER

Failure of MSEDCL to insist upon strict performance of any terms and conditions of the contract will not be deemed a waiver of any rights or remedies that MSEDCL may have and will not be deemed a waiver of any subsequent default under the terms and conditions of the contract. No right or remedy of MSEDCL will be exclusive of any other right or remedy and EMPLOYER will have all the rights and remedies given under the contract and now or hereafter existing in law or by statute. The shipping or delivery by the Bidder or receiving of or payment by MSEDCL for the work under this contract will not be deemed a waiver of any rights for any prior failure by the Bidder to comply with any of the provisions of the contract.

R. MEMBERS OF MSEDCL NOT INDIVIDUALLY LIABLE

No Director or official or employee of MSEDCL shall in any way be personally bound or liable for the acts or obligations of MSEDCL under the contract or answerable for any default or omission in the observance or performance of the acts, matters or things which are herein contained. The Bidder shall not be entitled to any increase on the scheduled rates or any other rights or claims whatsoever by reason of any representation, explanation, statement or alleged understanding, promise or guarantees given or to have been given to him by any person.

S. TRANSPORTATION

Bidder shall make his own arrangements for movement of human resources and equipment within and outside the sites/units/offices at the various locations covered by the Contract at his own cost.

T. BIDDER'S STAFF AND THEIR CONDUCT

1. The Bidder on award of work shall deploy qualified professionals as designated in the scope of the Contract for implementing contract. At any time in the opinion of the MSEDCL, any additional, qualified, experienced engineer is considered necessary; they shall be deployed by the Bidder without any additional charge. The Bidder shall ensure to the satisfaction of the MSEDCL competent and efficient supervision of the consulting services.

2. If any of the Bidder's employee in the opinion of MSEDCL be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the MSEDCL, undesirable for administrative or any other reasons, for such person(s) to be employed for providing consultancy services, then at the directions of the MSEDCL the Bidder shall at once remove such person (s) from the site(Works). Vacancy so created shall be immediately filled at the expense of the Bidder by a qualified and competent substitute. Should the Bidder be requested to repatriate any person or removed from this contract, he shall do so and shall bear all costs in connection therewith.

3. The Bidder shall be solely responsible for the proper behavior of his employees and staff employed by him/deputed by him to provide consultancy services. The Bidder shall exercise proper degree of control over them and in particular without prejudice to the said generality the Bidder shall be bound to prohibit/prevent any of his employees (as stipulated above) from trespassing or acting in anyway detrimental or prejudicial to the interest of the community or the properties or occupiers of land or properties in the neighborhood. In the event of such trespassing, the Bidder shall be responsible for all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the MSEDCL upon any matter arising under this clause shall be final.

4. All Bidder's personnel entering MSEDCL's premises shall be properly identified by badges of a type acceptable to MSEDCL which must be worn at all times on MSEDCL's premises.

5. It is made clear that no relationship of employer and employee is created between MSEDCL and the Bidder's resident engineers, employees and no claim for employment of any such personnel shall be tenable or entertained

U. SECURITY AND SAFETY REGULATIONS

The Bidder shall abide by all the safety and security regulations of the EMPLOYE Reinforce and promulgated from time to time and other statutory requirements.

V. EMPLOYEES PROVIDENT FUNDS AND MISCELLANEOUS PROVISIONS ACT

1. The Bidder shall ensure strict compliance of provisions of the Employees' Provident Funds and Miscellaneous Provisions Act 1952 and the schemes framed there under so far as they are applicable to their establishments and agencies engaged by them. The Bidder also required indemnifying the EMPLOYER against any loss or claims or penal damages whatsoever resulting out of non-compliance on the part of the Bidder with the provisions of the aforesaid Act and the Schemes framed there under.
2. The Bidder agrees to and does hereby accept full and exclusive liability for the compliance with all obligations imposed by Employees State Insurance Act, 1948, and the Bidder further agrees to defend, indemnify and hold Employer harmless from any liability or penalty which may be imposed by the Central, State or local authority by reason of any alleged violation by Bidder of the Employees' State Insurance Act, 1948and also from all claims, suits or proceedings that may be brought against the Employer arising under, growing out of or by reason of the work provided for by the Contract whether brought by employees of the Bidder , by third parties or by Central or State Government authority or any political sub-division thereof.
3. The Bidder agrees to file with the Employees State Insurance Corporation (ESI), the Declaration forms and all forms which may be required in respect of the Bidder's employee whose aggregate remuneration is within the specified limit and who is employed in the work provided or those covered by ESI Act and Employees Provident Funds (EPF) Sand Miscellaneous provisions Act 1952 under any amendment to the Act from time to time.
4. In absence of ESI, bidder has to provide Workmen Compensation and medical Insurance (for accident arising out/during the course of employment) for all the employees engaged in the performance of this Contract.
5. The Bidder agrees to maintain all records as required under the Act in respect of employees and payments. Any expenses incurred for the contributions, making contribution or maintaining records shall be to the Bidder's account.
6. The Employer shall retain such sum as may be necessary from the total contract value until the Bidder shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948, have been paid.

W. The Bidder shall conform in all respects with the provisions of any statutory regulations, ordinances or byelaws of any local or duly constituted authorities or public bodies which may be applicable from time to time to the consulting services work.

X. LIENS

If at any time there should be any evidence or any lien, claim for which the EMPLOYER might have become liable, which is chargeable to the Bidder , then the EMPLOYER may pay and discharge the same and deduct the amount so paid from any amount which may be or may become due and payable to the Bidder. If any lien or claim remain unsettled after all payments are made, the Bidder shall refund or pay to the EMPLOYER the cost such lien or claim including all payments and reasonable expenses. EMPLOYER reserves the right to the same.

Y. OTHER TERMS AND CONDITIONS

1. The Bidder is required to enter into agreement after submission of Initial Security deposit.
2. Should the EMPLOYER at any time require the Bidder to do any work beyond what is provided under this agreement, the Bidder shall undertake to do such additional work for an additional remuneration to be mutually agreed upon.
3. The EMPLOYER may make modifications/revisions/changes/deletions in the scope of work from time to time and the same shall be complied with by the Bidder without prejudice to his rights under the contract

Z. PROFILES OF TEAMS

The Bidder has to deploy a specialized and trained team for the successful and timely completion of the Project. The bidder shall submit the details of experience with proof.

AA. TEMPORARY SUSPENSION

MSEDCL may at any time temporarily suspend or stop the execution of the Contract or any part thereof by notice in writing to Contractor. All works so suspended or stopped shall be resumed by Contractor based on a schedule to be mutually agreed upon between MSEDCL and Contractor. In case of temporary suspension because of MSEDCL suitable compensation will be paid by MSEDCL on mutually agreed basis.

1. MSEDCL reserves to itself the right to withdraw from the tendering process or from any part thereof, to accept or reject any or all tenders, in full or any part, at any stage of process and / or to modify the process or any part thereof at any time thereof without assigning any reasons whatsoever. No financial obligation shall debit to MSEDCL in such an event. The Tenderers are advised to submit the tender strictly based on the terms and conditions and scope contained in the tender documents including corrigenda/amendments, if any, issued by MSEDCL prior to submission of tender. For corrigenda/amendment with financial implications, if any, issued by MSEDCL after submission of tender, but before opening of Price Bids, the Tenderers shall be entitled to amend their prices.
2. Bid documents shall comprise of various Annexure and Attachments as specified in Tender documents. In addition, any other document / instruction / amendments / Minutes of Meeting/revisions issued by the EMPLOYER to the bidder during pre-bid Conference or later till due date of submission of the offers, shall also be deemed to be integral part of the bid documents and order. Failure to furnish all the information required by the bidding document in every respect will be at bidder's risk.

‘

Responsibility Matrix:

The table in this section provides a summary definition of the roles and responsibilities of the AMISP and utility.

Legend:

- This indicates who has primary responsibility to perform this function

A: This indicates who will provide assistance

F: Feedback

Item	Task	MSEDCL	AMISP
1.0	**Problem Identification**		
1.1	Root cause analysis to determine whether the fault is attributable to Hardware or Software.	F	•
1.2	Resolution of problems involving third party maintainer where there is uncertainty whether the root cause is hardware or software.	A	•
2.0	**Software Problem Resolution**		
2.1	Report problem and assist with problem identification	F	•
2.2	Provide or recommend corrections, temporary patches, workarounds or other fixes to system problems	F	•
2.3	Install and test corrections, temporary patches, workarounds or other fixes to system problems	F	•
3.0	**Routine Software (including MDM, HES, Utility Interface, Consumer app/portal) Support**		
3.1	Build and maintain database, displays and reports	F	•
3.2	Perform system back-ups	F	•
3.3	Restore or reinstall software from back-ups	F	•
3.4	Monitor system logs (part of remote monitoring service)	F	•
3.5	Maintain system logs	F	•
3.6	Maintain user accounts	A	•
4.0	**Hardware (including meter, DCUs, routers etc.) Problem Resolution**		
4.1	Report problem and assist with defining problem	A	•
4.2	Troubleshoot problem to diagnose if it is software- related or hardware-related	F	•
4.3	Identify failed component, replace failed components in the system using parts from spares inventory	F	•
4.4	Restore operation of repaired/replaced equipment	A	•
5.0	**Hardware Spare Parts**		
5.1	Manage local spares inventory	F	•
5.2	Replenish local spares inventory	F	•
6.0	**Integration and Database Work**		

6.1	Field Device Integration	A	•
6.2	Other System Integration	A	•
7.0	**Cyber Security Monitoring**		
7.1	Patch Updates	F	•
7.2	Cyber Security Monitoring	F	•
7.3	Annual Audits	F	•
7.4	Implementation of Recommendations during Audit	F	•
8.	**Manual Meter Read Through HHU In Case of Non- Communication Of Smart Meters**	A	•

Data Polling Frequency

Parameters	Single Phase	Three Phase Meters
Instantaneous	Every 15 Min	Every 15 Min
Load Profile Data	Daily	Daily
Daily Load Profile/Billing Data/Midnight Data	Daily/Monthly	Daily/Monthly
Critical Events as Alarm	On Occurrence/On Restoration	On Occurrence/On Restoration
All Events as Info	Daily	Daily
Events Snapshot	Daily	Daily
Name Plate	With every parameter mentioned above	With every parameter mentioned above

Parameters	DT Meter	HT / Feeder Meters
Instantaneous	Every 1 Hour	Every 1 Hour
Load Profile Data	Daily	Daily
Daily Load Profile/Billing Data/Midnight Data	Daily/Monthly	Daily/Monthly
Critical Events as Alarm	On Occurrence/On Restoration	On Occurrence/On Restoration
All Events as Info	Daily	Daily
Events Snapshot	Daily	Daily
Name Plate	With every parameter mentioned above	With every parameter mentioned above

ANNEXURE -I

"INDEMNITY BOND"

UNDERTAKING TO BE SUBMITTED BY THE PARENT COMPANY SITUATED ABROAD IN CASE OF THE PARTICIPANT BIDDER WHO IS AN INDIAN BASED SUBSIDIARY ON GENERAL STAMP OF RUPEES 200/-

The Chief Engineer (MMD),
Maharashtra State Electricity Distribution Co. Ltd.,
Prakashgad,
Bandra (E),
Mumbai – 400 051.

Sub: Undertaking against Tender _____ for procurement of _____.

Dear Sir:

We, M/s. _____ having registered office at _____ are the Parent Company of M/s. _____ who have participated against your tender no. _____ for procurement of _____.

We have carefully read and have thoroughly understood and agree to the terms and conditions of the subject tender.

We hereby undertake that in case of placement of order against the subject tender on our subsidiary company, M/s. _____, in the event of we accept all the responsibilities and liabilities for supply of quality meters as per specification of the tender and execution of the contract. We further hereby undertake that we shall be responsible for any liability arising out of the contract placed on M/s. _____ and to pay MSEDCL on demand the sum of rupees as per agreement in the event of any breach of condition of the purchase order, loss and damage of the material till expiry of guarantee period as stipulated in the order. Our liability here under shall not be impaired or discharged by extension of time or variation or alteration made with or without our knowledge or consent by or between the parties to the said contract. This undertaking shall be valid and binding on us upto and including the execution and guarantee period of the order and shall not be terminable by notice or change in the constitution of any of the companies. In case of any dispute arising out of or in connection with this tender or contract, if concluded, the same shall be subject to the exclusive jurisdiction of the "Court in Mumbai (India)."

Yours faithfully,

(Authorized Signatory)

FOR _____

ANNEXURE – II
FORM OF AUTHORISED NOMINEE/ASSIGNEE
(To be submitted on the letter head of the foreign Bidder/Manufacturer)

Date:

To,
The Chief Engineer (MMD),
Maharashtra State Electricity Distribution Co. Ltd.
1st Floor, Prakashgad, Plot No. G-9,
Bandra (East) Mumbai – 400 051.
India

Subject: - Notification of invitation of bids against Tender No. ----------
For supply of Static Energy Meters of foreign origin.

Dear Sir,

This has reference to the Tender No. ---------- for supply of Static Energy Meters. We M/s. ---------- (foreign Bidder/Manufacturer) authorize our Assignee/Nominee in India M/s. ---------- to participate against Tender No. ----------. We M/s. ----------(foreign Bidder/Manufacturer) hereby agree, confirm, adopt unconditionally to abide by the offer of M/s. ---------- (Assignee/Nominee) for supply of Static Energy Meters.

Thanking you,

Your's Faithfully,

(Signature of the Authorized Signatory of foreign Bidder/Manufacturer)

(Name)

(Designation)

ANNEXURE – III

UNDERTAKING CUM INDEMNITY BOND FOR POLYCARBONATE ENCLOSURE OF SINGLE PHASE METERS

_____Not Applicable_____

Annexure IV#(A) PROFORMA FOR BANK GUARANTEE FOR BID SECURITY (EMD)

To: Maharashtra State Electricity Distribution Company Limited
Represented by
Chief Engineer (MMD)
Maharashtra State Electricity Distribution Co. Ltd.
1st Floor, Prakashgad, Plot No. G-9,
Bandra (East) Mumbai – 400 051.
India.

WHEREAS *[name and address of Contractor]* (hereinafter called "the **Contractor**") has undertaken, in pursuance of Tender No., dated for _____, (hereinafter called "the **Contract**");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of ***Rs.---------/- (Rs. ----------)*** and we undertake to pay you, through our branch office at _____ *[Address of branch office at Mumbai, Maharashtra],* upon your first written demand and without cavil or argument, any sum or sums within the limits of _____ *[amount of Guarantee]* as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

The bank guarantee will remain in force from date of issue till _____ (210 days from the Date of Issue of Tender). Any demand in respect thereto should reach the Bank not later than the specified date i.e. _____. (210 days from the Date of Issue of Tender).

The bank guarantee for bid security may be forfeited:

a) if the bidder withdraws its bid, except that written notice of the withdrawal of bid is received by the employer prior to the deadline for submission of bids; or

(b) if the bidder does not accept the correction of its bid price, pursuant to Tender Conditions; or

(c) if the bidder is determined, at any time prior to award of contract, to have engaged in corrupt or fraudulent practices as defined under tender in competing for the contract; or

(d) in the case of a successful bidder, if it fails within the specified time limit to:
(i) sign the Contract Agreement, or
(ii) furnish the required contract performance security

Yours truly,
Signature and seal of the Guarantor:
Name of Bank/Financial Institution:
Address:
Date:

_____
_____

ANNEXURE IV (B) PROFORMA FOR SECURITY / PERFORMANCE BANK GUARANTEE

(On Non-judicial paper for appropriate value)

To,

Maharashtra State Electricity Distribution Company Limited

Dear Sir,

In consideration of the Maharashtra State Electricity Distribution Company Limited,(herein after called 'the Company' which expression shall include its successors and assigns) having awarded to M/s. (Name)…….(Constitution)……..(address)…….(herein after referred to as "The vendor" which expression shall wherever the subject or context so permits include its successors and assigns) a supply contract in terms inter alia, of the Company's purchase order No……..dated…….and the General and Special Purchase Conditions of the Company and upon the condition of vendor's furnishing security for the performance of the vendor's obligations and / or discharge of the vendor's liability under and/or in connection with the said supply contract up to a sum of Rs. (in figures)……..Rs (in words)……only amounting to 5% (five percent) of the total contract value.

We, (Name)……..(constitution)……(hereinafter called "the Bank" which expression shall include its successors and assigns) hereby jointly and severally undertake and guarantee to pay to the Company in----- (Currency) for the with on demand in writing and without protest or demur of any and all moneys any wise payable by the Vendor to the Company under in respect of or in connection with the said supply contract inclusive of all the Company's losses and expenses and other moneys anywise payable in respect to the above as specified in any notice of demand made by the Company to the Bank with reference to this Guarantee upto an aggregate limit of Rs (in figures)……Rs(in words)……..only.

AND the Bank hereby agrees with the Company that

i. This Guarantee/undertaking shall be a continuing guarantee and shall remain valid and irrevocable for all claims of the Company and liabilities of the vendor arising up to and until midnight of ……..

This date shall be 6 months from the last date of guarantee period.

ii. This Guarantee/ Undertaking shall be in addition to any other guarantee or security of what so ever that the Company may now or at any time otherwise have in relation to the vendor's obligation/liabilities under and/or connection with the said supply contract, and the Company shall have full authority to take recourse too reinforce this security in preference to the other security(ies) at its sole discretion, and no failure on the part of the Company in enforcing or requiring enforcement of any other security shall have the effect of releasing the Bank from its liability here under.

iii. The Company shall be at liability without reference to the Bank and without effecting the full liability of the Bank hereunder to take any other security in respect of the vendor's obligations and/or liabilities under or in connection with the said supply contract and to vary the terms vis-à-vis the vendor of the said supply contractor to grant time and/or indulgence to the vendor or to reduce or to increase or otherwise vary the prices of the total contract value or to release or to for bear from enforcement all or any of the obligations of the vendor under the said supply contract and/or the remedies of the Company under any other security(ies) now or hereafter held by the

Company and no such dealing(s), variation(s), reduction(s), increase(s) or the indulgence(s) or arrangement(s) with the vendor or release or for bearance what so ever shall have the effect of releasing the Bank from its full liability to the Company hereunder or of prejudicing rights of the Company against the Bank.

iv. This Guarantee/Undertaking shall not be determined by the liquidation or winding up or dissolution or change of constitution or insolvency of the vendor but shall in all respects and for all purposes be binding and operative until payment of all moneys payable to the Company in terms hereof.

v. The Bank hereby waives all rights at any time inconsistent with the terms of the Guarantee/Undertaking and the obligations of the Bank in terms here of shall not be anywise affected or suspended by reason of any dispute or disputes having been raised by the vendor (whether or not pending before any Arbitrator, officer, Tribunal or Court) or any denial of liability by the vendor or any other order of communication what so ever by the vendor stopping or preventing or purporting to stop or prevent any payment by the Bank to the Company in terms hereof.

vi. The amount stated in any notice of demand addressed by the Company to the Guarantor as liable to be paid to the Company by the vendor or as suffered or incurred by the Company on account of any losses or damages of costs, charges and or expenses shall as between the Bank and the Company be conclusive of the amount so liable to be paid to the Company or suffered or incurred by the Company, as the case may be and payable by the Guarantor to Company in terms hereof.

Yours faithfully,

(Signature)

NAME & DESIGNATION

NAME OF THE BANK

NOTES:

Annexure V

Commitments of the Tenderer/Contractor

i. The Tenderer /Contractor commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the Contract execution;

ii. The Tenderer / Contractor will not directly or through any other person(s) or firm, offer, promise or give to the Principal, or to any of the Principal's employees involved in the tender process or the execution of the Contract or to any third person any material or immaterial benefit which he / she is not legally entitled to in order to obtain, in exchange, an advantage during the tender process or to vitiate the Principal's tender process or the execution of the Contract.

iii. The Tenderer / Contractor will not enter with other Tenderers into any illegal agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or actions to restrict competitiveness or to vitiate the Principal's tender process or the execution of the Contract.

iv. The Tenderer / Contractor will not commit any criminal offence under the relevant Anti- corruption Laws of India; further, the Tenderer / Contractor will not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

v. The Tenderer / Contractor will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

vi. The Tenderer/ Contractor will not take, directly or indirectly, any steps which could unduly influence the functioning of EIM.

vii. The Tenderer / Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Annexure VI

PRICE BID – I: AURANGABAD REGION

(A) PRICE BID FOR METER							
Description of material	Qty. required in nos.	Break-up of F.O.R. Destination Price					Total F.O.R. Destination price (In Rs.)
		Ex-works price excluding taxes & duties (In Rs.)	Freight charges (In Rs.)	Transit Insurance charges (In Rs.)	GST @-- % (In Rs)	F.O.R. Destination price per No. (In Rs.)	
(a)	(b)	(c)	(d)	(e)	(f)	(g) = (c+d+e+f)	(h)=(b * g)
Single phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	28,000						
Single phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	2,59,035						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	19,000						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	10,000						
Feeder Meter	200						
HT TOD Meter	150						
DTC Meter	2,800						
40-200 A Embedded Meter for LT consumers having load between 20 KW to 144 KW	800						
LTCT Operated Meters for LT consumers for load greater than 144 KW	15						
Total (A)	3,20,000						

(B) PRICE BID FOR METER INSTALLATION						
Item No.	Description of material	Quantity in Nos.	Charges / meter	GST / meter	Total / meter	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f)
1	Installation of Smart meter along with allied materials for Service Connections.	3,20,000				

(C) PRICE BID FOR METER READING (FMS)						
Item No.	Description of material	Quantity in Nos.	Charges / meter/Month	GST / meter/Month	Total / meter/Month	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f*80)
1	FMS charges including Sim Charges	3,20,000				

(D) PRICE BID FOR HEAD END SYSTEM					
Item No.	Description of material	Quantity in Nos.	Charges IN Rs.	GST in Rs.	Total in Rs.
(a)	(b)	(c)	(d)	(e)	f = (d+e)
1	Cost of Head End System/MDM/Cloud Charges inclusive of required licenses for OS, Database etc.	1			

PACKAGE COST FOR AURANGABAD REGION = A + B + C +D

Seal

Authorized Signature

Name and designation of Signatory

PRICE BID – II: KONKAN REGION

(A) PRICE BID FOR METER							
Description of material	Qty. required in nos.	Break-up of F.O.R. Destination Price					Total F.O.R. Destination price (In Rs.)
		Ex-works price excluding taxes & duties (In Rs.)	Freight charges (In Rs.)	Transit Insurance charges (In Rs.)	GST @-- % (In Rs)	F.O.R. Destination price per No. (In Rs.)	
(a)	(b)	(c)	(d)	(e)	(f)	(g) = (c+d+e+f)	(h)=(b * g)
Single phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	52,000						
Single phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	2,27,260						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	28,000						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	28,000						
Feeder Meter	300						
HT TOD Meter	500						
DTC Meter	1,200						
40-200 A Embedded Meter for LT consumers having load between 20 KW to 144 KW	2600						
LTCT Operated Meters for LT consumers for load greater than 144 KW	140						
Total (A)	3,40,000						

(B) PRICE BID FOR METER INSTALLATION						
Item No.	Description of material	Quantity in Nos.	Charges / meter	GST / meter	Total / meter	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f)
1	Installation of Smart meter along with allied materials for Service Connections.	3,40,000				

(C) PRICE BID FOR METER READING (FMS)						
Item No.	Description of material	Quantity in Nos.	Charges / meter/Month	GST / meter/Month	Total / meter/Month	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f*80)
1	FMS charges including Sim Charges	3,40,000				

(D) PRICE BID FOR HEAD END SYSTEM					
Item No.	Description of material	Quantity in Nos.	Charges IN Rs.	GST in Rs.	Total in Rs.
(a)	(b)	(c)	(d)	(e)	f = (d+e)
1	Cost of Head End System/MDM/Cloud Charges inclusive of required licenses for OS, Database etc.	1			

PACKAGE COST FOR KONKAN REGION = A + B + C +D

Seal

Authorized Signature

Name and designation of Signatory

PRICE BID – III: NAGPUR REGION

(A) PRICE BID FOR METER							
Description of material	Qty. required in nos.	Break-up of F.O.R. Destination Price					Total F.O.R. Destination price (In Rs.)
		Ex-works price excluding taxes & duties (In Rs.)	Freight charges (In Rs.)	Transit Insurance charges (In Rs.)	GST @-- % (In Rs)	F.O.R. Destination price per No. (In Rs.)	
(a)	(b)	(c)	(d)	(e)	(f)	(g) = (c+d+e+f)	(h)=(b * g)
Single phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	44,000						
Single phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	2,05,320						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	22,000						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	24,000						
Feeder Meter	350						
HT TOD Meter	200						
DTC Meter	2,700						
40-200 A Embedded Meter for LT consumers having load between 20 KW to 144 KW	1400						
LTCT Operated Meters for LT consumers for load greater than 144 KW	30						
Total (A)	3,00,000						

(B) PRICE BID FOR METER INSTALLATION						
Item No.	Description of material	Quantity in Nos.	Charges / meter	GST / meter	Total / meter	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f)
1	Installation of Smart meter along with allied materials for Service Connections.	3,00,000				

(C) PRICE BID FOR METER READING (FMS)						
Item No.	Description of material	Quantity in Nos.	Charges / meter/Month	GST / meter/Month	Total / meter/Month	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f*80)
1	FMS charges including Sim Charges	3,00,000				

(D) PRICE BID FOR HEAD END SYSTEM					
Item No.	Description of material	Quantity in Nos.	Charges IN Rs.	GST in Rs.	Total in Rs.
(a)	(b)	(c)	(d)	(e)	f = (d+e)
1	Cost of Head End System/MDM/Cloud Charges inclusive of required licenses for OS, Database etc.	1			

PACKAGE COST FOR NAGPUR REGION = A + B + C +D

Seal

Authorized Signature

Name and designation of Signatory

PRICE BID – IV: PUNE REGION

(A) PRICE BID FOR METER							
Description of material	Qty. required in nos.	Break-up of F.O.R. Destination Price					Total F.O.R. Destination price (In Rs.)
		Ex-works price excluding taxes & duties (In Rs.)	Freight charges (In Rs.)	Transit Insurance charges (In Rs.)	GST @-- % (In Rs)	F.O.R. Destination price per No. (In Rs.)	
(a)	(b)	(c)	(d)	(e)	(f)	(g) = (c+d+e+f)	(h)=(b * g)
Single phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	45,000						
Single phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	1,85,225						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (with enclosure)	21,000						
Three phase 10-60A Smart Meter (pre-paid/post-paid) (without enclosure)	63,000						
Feeder Meter	200						
HT TOD Meter	450						
DTC Meter	2,050						
40-200 A Embedded Meter for LT consumers having load between 20 KW to 144 KW	3000						
LTCT Operated Meters for LT consumers for load greater than 144 KW	75						
Total (A)	3,20,000						

(B) PRICE BID FOR METER INSTALLATION						
Item No.	Description of material	Quantity in Nos.	Charges / meter	GST / meter	Total / meter	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f)
1	Installation of Smart meter along with allied materials for Service Connections.	3,20,000				

(C) PRICE BID FOR METER READING (FMS)						
Item No.	Description of material	Quantity in Nos.	Charges / meter/Month	GST / meter/Month	Total / meter/Month	Total
(a)	(b)	(c)	(d)	(e)	f = (d+e)	g = (c*f*80)
1	FMS charges including Sim Charges	3,20,000				

(D) PRICE BID FOR HEAD END SYSTEM					
Item No.	Description of material	Quantity in Nos.	Charges IN Rs.	GST in Rs.	Total in Rs.
(a)	(b)	(c)	(d)	(e)	f = (d+e)
1	Cost of Head End System/MDM/Cloud Charges inclusive of required licenses for OS, Database etc.	1			

PACKAGE COST FOR PUNE REGION = A + B + C +D

Seal

Authorized Signature

Name and designation of Signatory

Annexure VII

Format for No Deviation Form

Tender Name:

Tender No. :

CERTIFICATE FOR NO DEVIATION

We, (Bidder's Name), hereby certify that there is no technical or commercial deviation from the Conditions mentioned in Tender Document and I am agreeing to all the terms and conditions mentioned in the Tender Specification.

Authorized Signatory with seal

Date:
Place:

Annexure VIII

SERVICE LEVEL AGREEMENT

1. Purpose of this Agreement

The purpose of this SLA is to clearly define the levels of service to be provided by Supplier to Purchaser for the duration of this contract or until this SLA has been amended. The benefits of this SLA are to:

1 Trigger a process that applies Purchaser and Supplier management attention to some aspect of performance only when that aspect drops below an agreed upon threshold, or target.

2 Makes explicit the performance related expectations on performance required by the Purchaser

3 Assist the Purchaser to control levels and performance of services provided by Supplier

4 This SLA is between Supplier and Purchaser.

2. Description of Services Provided

Supplier shall provide service as defined in Scope of Work, in accordance to the definitions and conditions as defined in this RFP.

2.1. Duration of SLA

This Service level agreement would be valid for entire period of contract. This SLA may be reviewed and revised according to the procedures detailed in "SLA Change Control".

2.2. Service Level Agreements & Targets:

This section is agreed to by Supplier and Purchaser as the key Supplier performance indicator for this engagement. The following section reflects the measurements to be used to track and report systems performance on a regular basis.

a) The indicative SLA to be measured is as below :

1) Penalty for non-availability of meter data :

Smart meters instantaneous parameters data should be downloaded at every 15 minutes intervals and made available at bidder's Head End System (HES). Penalty will be applicable for non-availability of 15 minute interval data as below.

Percentage of no. of smart meter readings (instantaneous data) available in bidder's HES per month	**Penalty (Considering one reading at every 15 minutes interval per Smart meter in a month)**
>= 99%	Payment as per % data availability per meter per month
>=90% and < 99%	Payment as per % data availability per meter per month & 10% penalty on monthly FMS cost per meter
Less than 90%	No payment for that smart meter & additionally 15% penalty on monthly FMS cost per meter

2) **Penalty for meter data availability for sub-division as unit :**

Penalty will be calculated on Sub-division wise percentage of data availability.

Sr. no.	Particular	Applicable Penalty
1	If data availability of all smart meters within a sub-division for first month falls below 95%	10 % penalty on monthly FMS cost of all Smart Meters in sub-division
2	If data availability of same sub-division again (i.e. for the second time) falls below 95 % for any subsequent month during the year (starting from go-live declaration)	15 % penalty on monthly FMS cost of all Smart Meters in sub-division
3	If data availability of same sub-division again (i.e. for the third time) falls below 95 % for any subsequent month during the year (starting from go-live declaration)	20 % penalty on monthly FMS cost of all Smart Meters in sub-division and Process for termination will be initiated

3) Action for non- availability of data for sub-divisions under Region

If data availability of any of the 3 sub-divisions under that Region is below 95 %, for consecutive 3 months in a year, then the process of termination will be initiated.

4) **Penalty for non- receipt of acknowledgement/ response for remote connect/disconnect of a Smart Meter.**

Penalty for non-receipt of acknowledgement/response for remote connect/disconnect of a smart meter is calculated as below.

a. Penalty of Rs. 500/- per meter, on which remote connect/disconnect action is not performed within 15 minutes will be applicable, for first occurrence during the year (starting from go-live declaration).

b. For every subsequent occurrence of same smart meter, during the year (starting from go-live declaration) penalty of Rs. 1,000/- per meter on which remote connect/disconnect action is not performed within 15 minutes, will be applicable.

c. If percentage of Smart Meters for a month, for which no acknowledgement / response received for remote connect / disconnect within 15 minutes, is more than 1% for sub-division/region, then the process of termination will be initiated.

Notes:

1. The penalties should be computed on the basis of performance of bidder for a calendar month.
2. Exclusions: Power Outages, Meter bypass by consumers, Local Temporary/ Permanent disconnection by MSEDCL, Meter burnt shall be excluded from above SLA calculations. For these cases, joint visit of bidder and MSEDCL officials shall be carried out and field inspection report shall be submitted by bidder to MSEDCL for suitable action.

5) Penalty for non-availability of AMI system (HES, MDM) during the month

Penalty will be calculated for non-availability of AMI system (HES & MDM) during the month as below.

Availability of AMI System per month	Penalty
>= 99.5%	Penalty of 1% of monthly FMS charges per 1% reduction (or part thereof) in availability upto 95%. If AMI system availability is below 95% for a month, penalty of 10% of monthly FMS charges and the process of termination will be initiated.

Note: Total SLA Penalty per month shall be capped at 20% of monthly FMS charges for a region.

2.3. Breach of SLA

In case the Supplier does not meet the service levels mentioned in this Section for three (3) continuous time-periods as specified in the relevant clause, the Purchaser will treat it as a case of breach of Service Level Agreement. The following steps will be taken in such a case:-

1. Purchaser issues a show cause notice to the Supplier.
2. Supplier should reply to the notice within three working days.
3. If the Purchaser authorities are not satisfied with the reply, the Purchaser will initiate termination process as described GCC.

2.4. Exclusions

The Supplier will be exempted from any delays or slippages on SLA parameters arising out of reasons absolutely beyond the control of Supplier, such as force majeure events like natural calamities, flood, etc. Documentary evidence shall be produced to the satisfaction of tender issuing authority by Supplier. Decision for exclusions of SLA will be taken by tender issuing authority.

2.5. Monitoring and Auditing

Purchaser will review the performance of Supplier against the SLA parameters each month, or at any periodicity defined in the contract document. The review / audit report will form basis of any action relating to imposing penalty or breach of contract. Any such review / audit can be scheduled or unscheduled. The results will be shared with the Supplier as soon as possible. Purchaser reserves the right to appoint a third-party auditor to validate the SLA.

2.6. Reporting Procedures

The Supplier's representative will prepare and distribute SLA performance reports in an agreed upon format by the 10th working day of subsequent month of the reporting period. The reports will include "actual versus target" SLA performance, a variance analysis and discussion of appropriate issues or significant events. Performance reports will be distributed to the Purchaser's IT Team.

2.7. Issue Management Procedures

a. General

This process provides an appropriate management structure for the orderly consideration and resolution of business and operational issues in the event that quick consensus is not reached between Purchaser and Supplier. It is expected that this pre-defined process will only be used on an exception basis if issues are not resolved at lower management levels.

b. Issue Management Process

- Either Purchaser or Supplier may raise an issue by documenting the business or technical problem, which presents a reasonably objective summary of both points of view and identifies specific points of disagreement with possible solutions.
- Purchaser and the Supplier's representative will determine which committee or executive level should logically be involved in resolution.
- A meeting or conference call will be conducted to resolve the issue in a timely manner. The documented issues will be distributed to the participants at least 24 hours prior to the discussion if the issue is not an emergency requiring immediate attention.
- Management of Purchaser and Supplier will develop a temporary, if needed, and the permanent solution for the problem at hand. The Supplier will then communicate the resolution to all interested parties.
- In the event a significant business issue is still unresolved, the arbitration procedures described in the Contract will be used.

2.8. SLA Change Control

a. General

It is acknowledged that this SLA may change as Purchaser's business needs evolve over the course of the contract period. As such, this document also defines the following management procedures:

1. A process for negotiating changes to the SLA.

2. An issue management process for documenting and resolving particularly difficult issues.
3. Purchaser and Supplier management escalation process to be used in the event that an issue is not being resolved in a timely manner.

Any changes to the levels of service provided during the term of this agreement will be requested, documented and negotiated in good faith by both parties. Either party can request a change. Changes will be documented as an addendum to this document and consequently the contract.

b. SLA Change Process
Both the parties may amend this SLA by mutual agreement in accordance. Changes can be proposed by either party. Normally the forum for negotiating SLA changes will be Purchaser's monthly review meetings.

c. Version Control
All negotiated SLA changes will require changing the version control number. As appropriate, minor changes may be accumulated for periodic release (e.g. every quarter) or for release when a critical threshold of change has occurred.

2.9. Management Escalation Procedures

The purpose of this escalation process is to provide a quick and orderly method of notifying both parties that an issue is not being successfully resolved at the lowest possible management level. Implementing this procedure ensures that purchaser and Supplier management are communicating at the appropriate levels. Escalation should take place on an exception basis and only if successful issue resolution cannot be achieved in a reasonable time frame.

1. All issues would be raised to the project management team, which is completely responsible for the day to day aspects of the implementation. The project management team shall classify the issues based on their severity level and resolve them within appropriate timelines.
2. If project management team is unable to resolve an issue, the issue would be escalated to the top management with options/ risks detailed for decision. Purchaser‘s Top management will make decisions based on the options/ risks presented by Purchaser.
3. In case one or both the parties are unsatisfied with the decision of the top management of the Purchaser, the dispute will be resolved as specified in GCC.

2.10. Responsibility

The bidder shall be responsible for roles and responsibilities with respect to the Requisite Services. Further, terms & conditions mentioned in this RFP shall be binding on bidder.

2.11. Signature Page

IN WITNESS WHEREOF, the parties hereto have caused this Service Level Agreement to be executed by their respective authorized representatives as of the date first written above.

Supplier	**Purchaser**
Signature	Signature
Name	Name
Address	Designation
Company	Utility: Maharashtra State Electricity Distribution Co. Ltd.
Date	Date

Annexure IX

WORKING MANUAL

For smooth execution of project, standard operating procedures / working manual will be shared with successful bidder.

Annexure X

Check List

We confirm that we have gone through the bid document and as instructed in the document, we hereby submit the following documents to form the bid:

Sr. No.	Name of document	Whether submitted Yes/ No	File Name
1.	Annexure – I : Indemnity Bond for Foreign Bidder / Manufacturer		
2.	Annexure –II : For Authorized Assignee / Nominee in case of Foreign Bidder		
3.	Annexure –III : Indemnity Bond for Polycarbonate Meter Enclosure		
4.	Annexure –IV (A) : Proforma for Bid Security (EMD)		
5.	Annexure –V : Commitments of tenderer / contractor		
6.	Annexure –VI : Price Bid Format		
7.	Annexure –VII : No Deviation Proforma		
8.	Annexure –VIII : Proforma for Service Level Agreement (SLA)		
9.	Annexure –X : Check list		
10.	Annexure –XI : Milestone		
11.	Annexure – XII : Offered Region		
12.	Annexure – XIII : Consortium Agreement		
13.	Annexure – XIV : Bill of Material		
14.	Manufactures Authorization for OEM		
15.	**Any other information/documents required as per RFP.**		

Annexure XI

MILESTONES

(To be submitted separately for each region)

Month	% Qty. to be Supply, installed & commissioned
Up to 3rd Month	10%
4	20%
5	30%
6	40%
7	50%
8	60%
9	70%
10	80%
11	90%
12	100%

Annexure XII

Region wise Offer Quoted

Sr. No.	Region Name	Quoted for Region (Yes/No)	Communication Technology Offered
1	Konkan		
2	Pune		
3	Aurangabad		
4	Nagpur		

Annexure XIII

Format of Consortium Agreement to be entered amongst all Members of Bidding Consortium

[To be on non-judicial stamp paper of Rupees One Hundred Only (INR 100/-) or appropriate valueas per Stamp Act relevant to place of execution, duly signed on each page. Foreign entities submitting Bid are required to follow the applicable law in India.]

FORM OF CONSORTIUM AGREEMENT BETWEEN
M/s....., M/s. ....., M/s .....,
AND M/s.....for bidding for Tender No. [Tender Details] (the "RFP") dated
[Date]

THIS Consortium Agreement (hereinafter referred to as "Agreement") executed on this ..... *[date]* day of ..... *[month]*,.....*[year]* between

2. M/s. ....., a company incorporated under the laws of ..... and having its Registered Office at..... , (hereinafter called "**Party 1**," or "**Lead Consortium Member**" which expression shall include its successors, executors and permitted assigns);
3. M/s. ....., a company incorporated under the laws of ..... and having its Registered Office at..... , (hereinafter called "**Party 2**," which expression shall include its successors, executors and permitted assigns);

[The Bidding Consortium should list the name, address of its registered office and other details ofall the Consortium Members above.]

WHEREAS the Parties above named are entering into this Consortium Agreement for the purpose of submitting the Bid in response to the RFP and in the event of selection as Selected Bidder to comply with the requirements as specified in the RFP and ensure execution of the AMISP Contract as may be required to be entered into with MSEDCL.

Party 1, Party 2 are hereinafter collectively referred to as the "Parties" andindividually as a "Party.

WHEREAS the RFP stipulates that the Bidders applying as a Bidding Consortium shall submit a legally enforceable Consortium Agreement in a format specified in the RFP, whereby each Consortium Member undertakes to be liable for its Roles and Responsibilities, provide necessary guarantees and pay required fees as required as per the provisions of the RFP, as specified herein.
WHEREAS any capitalized term in this Agreement shall have the meaning ascribed to such term in the RFP document.

NOW THEREFORE, THIS AGREEMENT WITNESSTH AS UNDER:
In consideration of the above premises and agreement all the Parties in this Consortium do hereby mutually agree as follows:

1. In consideration of the selection of the Consortium as the Bidding Consortium by MSEDCL, we the Members of the Consortium and Parties to the Consortium Agreement do hereby unequivocally agree that M/s..... *[Insert name of the Lead Member]*, shall act as the Lead Member as defined in the RFP for self and agent for and on behalf of M/s. ....., M/s. ....., M/s. ....., and M/s. ..... *[the names of all the other Members of the Consortium to be filled in here]*.

2. The Lead Consortium Member is hereby authorized by the Members of Consortium and Parties to the Consortium Agreement to bind the Consortium and receive instructions for and on behalf of all

Members. The Roles and Responsibilities of all other members shall be as per the **Annexure** to this Agreement. In the event the Consortium is selected pursuant to the Bidding Process, the shareholding of all each of the Consortium Members in the AMISP shall be as under:

S.No	Party	Proposed Shareholding
1.	Lead Consortium Members	(Not Less than 51%)
2.	Party 1	(Not Less than 25%)

3. Each Consortium Member undertakes to be individually liable for the performance of its part of the Roles and Responsibilities without in any way limiting the scope of collective liability envisaged in this Agreement in order to meet the requirements and obligations of the RFP. The Lead Consortium Member shall be liable and responsible for ensuring the individual and collective commitment of each of the Members of the Consortium in discharging all their respective Roles and Responsibilities.

4. In case of any breach of any of the commitment as specified under this Agreement by any of the Consortium Members, the Lead Consortium Member of the Consortium shall be liable to meet the obligations as defined under the AMISP Contract and the RFP.

5. Except as specified in the Agreement, it is agreed that sharing of responsibilities as aforesaid and obligations thereto shall not in any way be a limitation of responsibility of the Lead Member under these presents.

6. The Members expressly agree to adhere to all the terms and conditions of the RFP and confirm that we don't have any Conflict of Interest (as defined in the RFP).

7. This Consortium Agreement shall be construed and interpreted in accordance with the Laws of India and Courts at [Place] shall have the exclusive jurisdiction in all matters relating thereto and arising there under.

8. It is hereby agreed that the Lead Consortium Member shall furnish the Bid Security, as stipulated in the RFP, on behalf of the Bidding Consortium.

9. It is hereby agreed that in case of selection of Bidding Consortium as the AMISP, the Parties to this Consortium Agreement do hereby agree that they shall furnish the Performance Security and other commitments to MSEDCL as stipulated in the RFP and AMISP Contract. The Lead Member shall be responsible for ensuring the submission of the Performance Security and other commitments on behalf of all the Consortium Members.

10. It is further expressly agreed that the Consortium Agreement shall be irrevocable and, for the AMISP, shall remain valid over the term of the Project, unless expressly agreed to the contrary by MSEDCL.

11. The Lead Consortium Member is authorized and shall be fully responsible for the accuracy and veracity of the representations and information submitted by the Consortium Members respectively from time to time in response to the RFP for the purposes of the Bid. The representation by the Lead Member shall be deemed to be on behalf of and binding on all members of the Consortium.

12. It is expressly understood and agreed between the Members of the Consortium and Parties that the responsibilities and obligations of each of the Members shall be as delineated as annexed hereto as **Annexure-A** forming integral part of this Agreement. It is further agreed by the Members that the above sharing of responsibilities and obligations shall not in any way be a limitation of responsibilities and liabilities of the Members, with regards to all matters relating to the execution of the Bid and implementation of the Project envisaged in the RFP Documents.

13. It is clearly agreed that the Lead Consortium Member shall ensure performance indicated in the RFP. In the event one or more Consortium Members fail to perform its/ their respective obligations, the same shall be deemed to be a default by all the Consortium Members.

14. It is hereby expressly agreed between the Parties to this Consortium Agreement that neither Party shall assign or delegate or subcontract its rights, duties or obligations under this Agreementto any person or entity except with prior written consent of MSEDCL.

15. This Consortium Agreement:

a) has been duly executed and delivered on behalf of each Party hereto and constitutes the legal, valid, binding and enforceable obligation of each such Party;
b) sets forth the entire understanding of the Parties hereto with respect to the subject matter hereof; and
c) may not be amended or modified except in writing signed by each of the Parties and with prior written consent of MSEDCL.

Common Seal of ..... has been affixed in my/ our presence pursuant to Board Resolution dated	For M/s. ..... (Party 1) [Signature of Authorized Representative] ..... [Name of the Authorized Representative] [Designation of the Authorized Representative]

Witness 1
[Signature of Witness 1]
.....

Name
Designation
Witness 2
[Signature of Witness 2]
..... Name:
Designation:

..	
N. Common Seal of ..... has been affixed in my/ our presence pursuant to Board Resolution dated	For M/s. ..... (Party N) [Signature of Authorized Representative] ..... [Name of the Authorized Representative] [Designation of the Authorized Representative]
N.1. Witness 1 [Signature of Witness 1] ..... Name: Designation:	N.2. Witness 2 [Signature of Witness 1] ..... Name: Designation:

Annexure-A

Role and Responsibility of each Member of the Consortium:

1. Roles and Responsibilities of the Party 1 (Lead Consortium Member):
2. Roles and Responsibilities of the Party 2

Annexure XIV

Format of Bill of Quantities

Please Note: The list is indicative only. This needs to be detailed out and customized by [AMISP] basis Project requirement

Table 1: Bill of Materials and Services for Smart Meters [Indicative Only. To be definedby AMISP]

Sr No.	Item Description	Unit	Quantity	Country of Origin
1.	**Meters (including Communication module/NIC card)**			
1.1	Single phase Smart Prepaid Meter	Nos.		
1.2	Three phase Smart Prepaid Meter			
1.3	DT Meter			
1.4	Feeder Meter			
	Sub Total 1			
2.	**Mandatory Spares**			
2.1	X% of Subtotal 1	Lot		
2.2	....			
..	..			
	Sub Total 2			
3.	**Installation & Commissioning**			
3.1	Supply, Installation, Commissioning & Testing & Integration with Existing System (if any)	Job		
3.2	Meter Boxes	Nos		
..	..			
	Sub Total 3			
4.	**Other Requirement**			
4.1	Any other product/ services, if required, along with details.	Nos./ Lot/		
	Sub Total 4			
5.	**Communications Hardware**			
5.1	NIC/ Communication Module (price to be quoted only for sourcing additional quantity if required.	Nos.		
5.2	Data Concentrator Units/Access points			
....	.....			
	Sub Total 5			

Table 2: Bill of Materials and Services for Software [Indicative Only. To be defined byAMISP]

Sr. No.	Item Description	Unit	Quantity	Country of Origin
1.	**Application Software**			
1.1	Head End System (HES)	Lot		
1.2	Meter data management (MDM)	Lot		
1.3	....			
..	..			
	Sub Total 1			
2.	**Data Archiving Software**			
2.1	Data Archiving and SAN management software	Lot		
2.2	....			
..	..			
	Sub Total 2			
3.	**Network Management Software**			
3.1	Centralized network management software along with patch management & identity management	Lot		
3.2	Antivirus software	Lot		
3.3	Access control software with single sign on feature			
…	….			
..	..			
	Sub Total 3			
4.	**Installation & Commissioning**			
4.1	Supply, Installation, Commissioning & Testing & Integration with Existing System (if any)	Job		
4.2	....			
..	..			
	Sub Total 4			
5.	**Other Requirement**			
5.1	Any other product/ services, if required, along with details.	Nos./ Lot/		
	Sub Total 5			

Bill of Materials and Services for Head End System (HES) & Meter Data Management System (MDM)

[Indicative Only. To be defined by bidder]

Sr. No.	Item Description	Unit	Quantity	Country of Origin
1.	**Hardware**			
1.1	Application server			
1.2	Database server			
1.3	Any other server if required			
..	..			
	Sub Total 1			
2.	**Application Software**			
2.1	Head End System (HES) application			
2.2	Database			
..	..			
	Sub Total 2			
3.	**Other Requirement**			
3.1	Any other product/ services, if required, along with details.			
	Sub Total 3			

Following details should be provided for cloud instance

Sr. No.	Operating System	vCPUs	RAM (in GB)	Storage (in GB)	Other details
1					
2					
3					

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

LT AC SINGLE PHASE, 10-60 AMPS OR 5-60 AMP (WIDE RANGE) SMART (PREPAID/POSTPAID) STATIC ENERGY METER AS PER IS: 16444-2015

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1.00 SCOPE

This specification covers the design, engineering, manufacture, assembly, stage testing, inspection and testing before dispatch and delivery at designated stores of ISI marked LT AC 10-60 Amps or 5-60 Amps wide range AMR compatible Smart (Prepaid/Postpaid) Static LCD Energy Meter of class 1.0 accuracy with communication module confirming to IS: 16444 / 2015 of the latest version suitable for measurement of Energy (kWh) and Demand (kWMD) in Single Phase, Two wire system of LT single phase consumers.

The meter shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 SERVICE CONDITIONS

The meter to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

a) Specified operating temperature range - 10^0 C to + 55^0 C

b) Limit range of operation - 25^0 C to + 55^0 C

c) Limit range of storage and transport - 25^0 C to + 70^0 C

Environmental Conditions

d)	Maximum ambient temperature	55^0 C
e)	Maximum ambient temperature in shade	45^0 C
f)	Minimum temperature of air in shade	35^0 C
g)	Maximum daily average temperature	40^0 C
h)	Maximum yearly weighted average temperature	32^0 C
i)	Relative Humidity	10 to 100 %
j)	Maximum Annual rainfall	1450 mm

k)	Maximum wind pressure	150 kg/m^2
l)	Maximum altitude above mean sea level	1000 meter
m)	Isoceraunic level	50 days/year
n)	Seismic level (Horizontal acceleration)	0.3 g

o) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

3.00 APPLICABLE STANDARDS

While drawing these specifications, reference has been made to following Indian and International Standard specification. In case certain details are not covered in these specifications, the relevant Indian and International Standard shall be applicable.

IS 16444 (2015):A.C. Static Direct Connected Watt hour Smart Meter class 1.0 and Class 2.0

IS 13779 (1999):A.C. Static Watt hour meter class 1.0 and Class 2.0

IS 9000: Environment testing

IS15959 / 2011 (Part I): Data Exchange for Electricity Meter Reading, Tariff and Load Control – companion specification amended up to the date of tenderization.

IS15959 / 2016 (Part II): Data Exchange for Electricity Meter Reading, Tariff and Load Control – companion specification for smart meter amended up to date of tenderization.

IS 12346 (1988): Specification for testing equipment for A.C. Electrical Energy Meter

IS 15707/2006: Specification for testing, evaluation, installation and maintenance of A.C. Meters-Code of Practice.

CBIP- No 325 (Amended upto date):Specification for A.C Static Energy Meters for magnetic influence tests

IS 15884 (2010): Alternating Current Direct Connected Static Prepayment Meters for Active Energy (Class 1 and 2)

CEA Regulation on installation and operation of meters
Dtd: 17/03/2006

IEC 62052-11 (2003) : Electricity Requirements (AC) General Requirements, Tests and Test conditions for A.C. Static Watt hour meter for active energy Class 1.0 and 2.0.

IEC 62053-21 (2003) : A.C. Static Watt hour meter for active energy Class 1. and 2.0.

NOTE: Unless otherwise specified elsewhere in this specification the meters shall confirm to the latest version available of the standard as specified above. If above IS/IEC reports are amended, reference has to be made to Amended IS/IEC/Report up to the date of tenderization.

4.00 ADVANCED METERING INFRASTRUCTURE (AMI)

4.01 **AMI functional requirement:**

4.01.01 The main objective of AMI is to establish / enable two-way communication between smart energy meter and Head End System (HES) to enable remote reading, monitoring & control of electrical energy meters to serve as repository of all accumulated raw and validated data. The sanitized data may be subscribed by other utility function for higher order analysis and billing and collection engine etc.

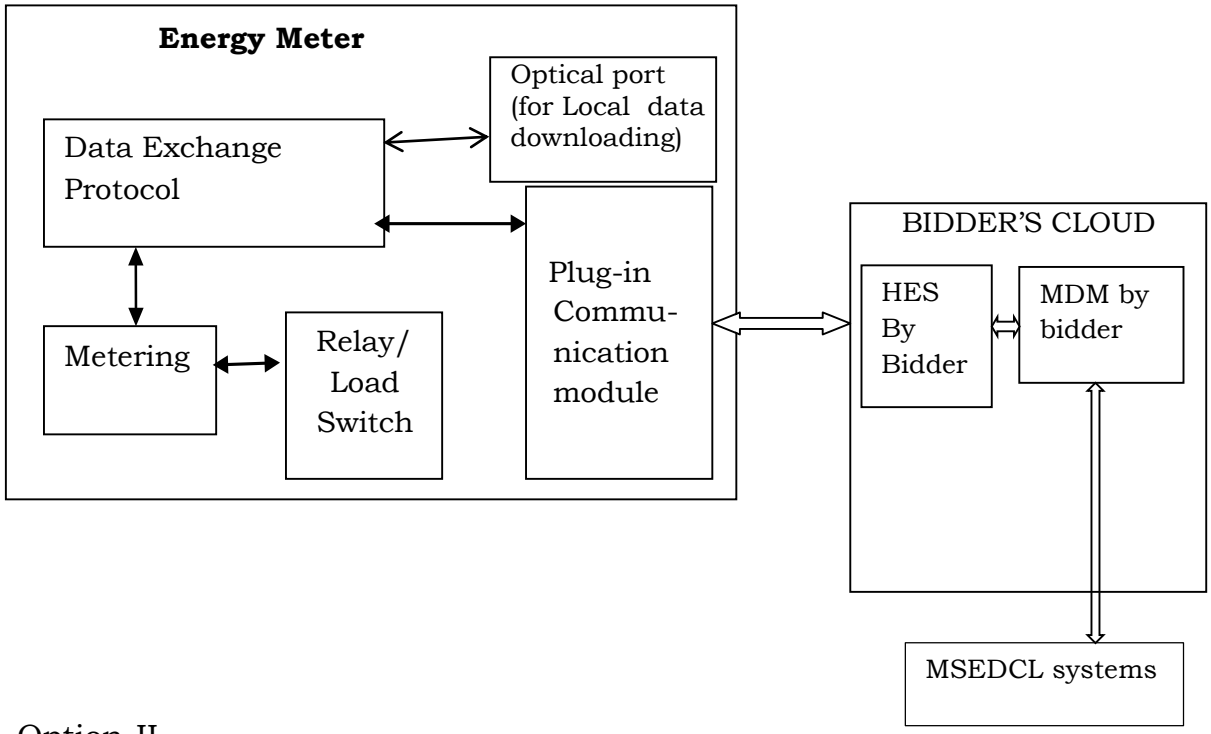
4.01.02 The AMI system shall help utility to manage their resource and business process efficiently. AMI system shall support the following minimum functionalities:

a) Remote Meter data reading (Scheduled/Instantaneous) at configurable intervals (push/pull)
b) Time of Use (TOU) metering;
c) Pre-paid functionality (by default) with provision of post-paid functionality without need for any additional infrastructure;
d) Alarm/Event detection, notification and reporting;
e) Load Limiter and connection/ disconnection at defined/on demand conditions which can be configured remotely in advance;
f) Network Monitoring System for the field area network (NAN/WAN), Remote firmware upgrade, configuration of network nodes and system time synchronization across all devices to ensure accuracy of time stamping;
g) Integration with other existing systems of utility;
h) Security features to prevent unauthorized access to the AMI including Smart Meter & meter data etc.

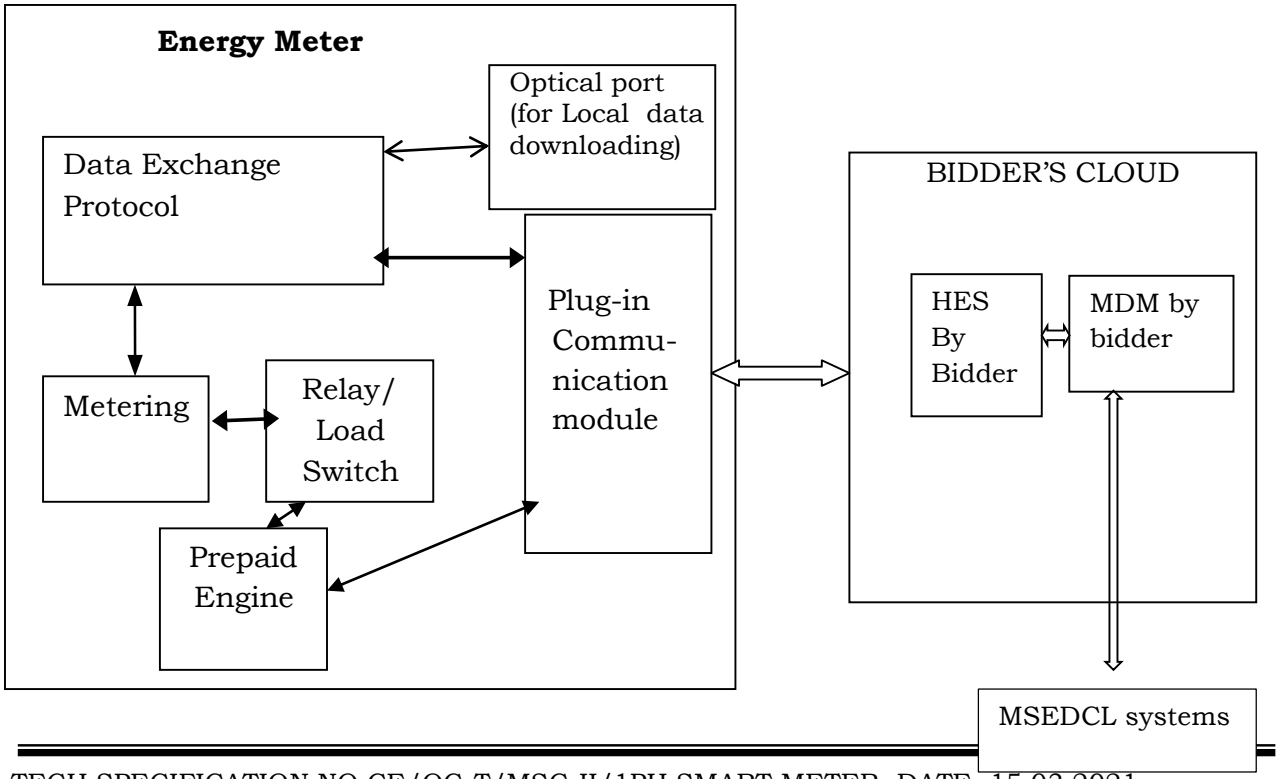
4.01.03 The AMI system shall have following core components of AMI system:

a) Smart Meters;
b) Communication infrastructure;
c) Head End System (HES).

d) Meter Data Management System (MDM);
e) Network Management System (NMS)
Option-I



Option-II



4.02 **Smart Prepaid/Postpaid Meters :**

Smart prepaid/Postpaid meters should comply specifications given in this document.

Metering and metrology requirement shall be according to IS 16444:2015 (A.C. Static direct connected watt-hour smart meters Class 1and 2).

The prepaid functionality can be availed at smart meter level or through MDM.

4.02.01 **Relay/Load Switch:**

The meter shall be provided with switching elements, integral with the meter enclosure, to control the flow of electricity to the load at the instance of connect/disconnect commands as per functional needs of the system.

4.02.02 **Plug-in communication module :**

a. The meter shall be provided with plug-in type communication module (6LoWPAN LPRF or 4G GPRS or NB-IOT or LoRa or PLC) capable of establishing wireless communication with external entities such as Head End System, server etc. Two way communications with external entities should be possible. The selection of communication technology should be as per the site conditions and as per design consideration of bidder to meet the performance as per agreed Service Level Agreements (SLAs).

b. The Smart Meters shall have a dedicated sealable slot for accommodating plug-in type bi-directional communication module which shall integrate the respective communication technology (6LoWPAN LPRF or 4G GPRS or NB-IOT or LoRa or PLC) with the Smart Meters, leading to easy adaptability for network interfaces (WAN/NAN). General requirement for common pluggable communications module for Smart Meters should be as per IS 16444.

c. The Plug-In module should be as per IS 16444. The meter shall log removal of the plug-in type communication module removal with snapshot.

d. Functionalities of communication module are as below:
   1. Establish wireless communication with external entities such as Head End System, server etc. The communication

should be bi-directional i.e. from meter to external entity and from external entity to meter.

2. Communication module should support both push and pull features.
3. Communication module should push meter data, events continuously to Head End System (HES) running on bidder's cloud. Default interval for pushing data is 15 minutes and also it should be configurable.
4. Events should be pushed to Head End System (HES) by communication module immediately after occurrence and restoration.
5. It is possible to schedule the communication module from Head End System (HES) to pull any data on demand.
6. Communication module should transfer the connect/disconnect signals received from Head End System (HES) to meter.

e. The selection of communication technology should be as per the site conditions and as per design consideration of bidder to meet the performance as per agreed Service Level Agreements (SLAs).
f. The communication between meter and Head End System (HES) should be secure. It should not be possible to alter the contents during communication.
g. The communication technologies to be implemented should follow relevant national and international standards as applicable. Any suitable standard from International Telecommunication Union (ITU)/ International Electro-technical Commission (IEC)/ Institute of Electrical and Electronics Engineers (IEEE) /European Standardization Organization (CEN/CENELEC/ETSI) may be considered. Necessary certifications should be provided by bidder for the proposed communication technology, wherever required as per government norms.
h. Cellular technologies if proposed, should be supporting 4G (with facility to fallback on 2G, in case of non-availability of 4G network) or NBIoT or an optical fiber communications network complying to IPv6.
i. Following requirements shall be complied if RF Technology is proposed by bidder for communication module.

a. RF technology proposed shall be in the frequency bands notified by Government of India.

b. RF technology proposed need to comply with Indian statutory bodies that govern communication related aspects such as WPC (Wireless Planning Co-ordination wing). Equipment Type Approval (ETA) is to be obtained for communication modules as per Department of Telecom, Govt. of India requirements. The bidder shall submit ETA approval issued by WPC along with offer.

c. Radio emission characteristics for the chosen band shall comply with latest NFAP (National Frequency Allocation Plan) and the G.S.R (General Statutory Rules) notifications from Department of Telecom, Government of India.

j. 4G/NBIoT COMMUNICATION MODULE

i. The meter should have 4G/NBIoT communication module. The 4G module should have facility to fall back to 2G networks, where 4G network is not available.

ii. The 4G module should support both Data and SMS transmission. It should have GPRS/EDGE and 4G LTE features.

iii. There should be provision to insert SIM card externally. The SIM slot should have adequate sealing arrangements.

iv. The functionalities of 4G/NBIoT module should be as given in clause No. 4.02.02.d.

k. 6LoWPAN LPRF COMMUNICATION MODULE

1. The meter shall have 6LoWPAN LPRF communication module. The smart meter data using RF mesh shall be collected by Data Concentrator Units (DCUs) and transported to HES through WAN.

2. The 6LoWPAN based Internal Low Power Radio Frequency (LPRF) module shall be based on 6LoWPAN networking on sub-1 GHz (865-867 MHz).

l. Optical port:

The meter should have optical port for wired data download locally. The optical port complying with hardware specifications

detailed in IEC – 62056 – 21. The baud rate while downloading data through optical port should be 9600. Optionally, it should be possible to download the data through optical port in case of power failure.

4.03 **Communication Infrastructure**

Requirements of communication infrastructure are given in RFP. If RF based solution is proposed, DCU/Gateway/Router/Access points should be installed.

4.04 **HEAD END SYSTEM (HES)**

Bidder has to deploy Head End System (HES) as per details given in RFP.

4.05 **METER DATA MANAGEMENT SYSTEM (MDM)**

Bidder has to deploy Meter Data Management System (MDM) as per details given in RFP. The prepaid functionality can either be availed at smart meter level or through MDM.

5.00 GENERAL TECHNICAL REQUIREMENTS

The equipment shall conform to the following specific parameters.

5.01 The meter to be supplied shall bear ISI mark before commencement of supply.

5.02 **Class of Accuracy:**

The class of accuracy of the energy meter shall be 1.0. The accuracy shall not drift with time.

5.03 **Current & Voltage Rating**:

The current rating shall be 10-60 or 5- 60 Amps. The rated basic current (Ib) shall be 5 or 10 Amps.

The maximum continuous current (Imax) shall be 600% of rated basic current i.e. 60 Amps. Moreover the 10-60 Amps meter shall work accurately up to 120% of Imax, i.e. 72 Amps.

The Voltage Rating shall be 240 volts. The voltage range shall be (-) 40 % to (+) 20% of rated voltage, i.e. 144 Volts to 288 Volts.

5.04 **Temperature:**

The reference temperature for performance shall be 27^{O} C. The mean temperature co-efficient shall not exceed 0.07%. Temperature rise shall be as per IS: 15884 / 2010 of the latest version.

5.05 **Power Factor:**

The meter shall work for Zero to unity PF (All lag or lead).

5.06 **Power Consumption.**

5.06.01 **Voltage Circuit**:

The active & apparent power consumption in voltage circuit including power supply of meter at reference voltage, reference temperature & frequency shall not exceed 5 Watts & 15 VA during the idle mode of communication module. The additional power requirement during data transmission shall not exceed 7W per communication module.

5.06.02 **Current Circuit**:

The apparent power taken by current circuit at maximum current, reference frequency & reference temperature shall not exceed 11.5 VA during the idle mode of communication module.

5.07 **Starting Current.**

Meter shall start registering the energy at 0.2 % of basic current (I_b).

5.08 **Frequency.**

The rated frequency shall be 50 Hz with a tolerance of ± 5%.

6.00 CONSTRUCTION

6.01 **GENERAL MECHANICAL REQUIREMENT**

The Smart (Prepaid/Postpaid) meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

b) personal safety against electric shock:

c) personal safety against effects of excessive temperature;

d) protection against spread of fire;

e) protection against penetration of solid objects, dust and water in the meter.

6.02 Meters are required for measurement of Active Energy and shall conform to the latest edition of IS: 16444 / 2015 (Alternating Current

Static Direct Connected Watthour Smart Meters (Class 1 and 2) Specification.

6.03 The meter shall measure the electrical energy consumed.

6.04 All parts, which are subject to corrosion under normal working conditions, shall be protected effectively against corrosion by suitable method to achieve durable results. Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions. The electrical connections shall be such as to prevent any opening of the circuit under normal conditions of use as specified in the standard, including any overload conditions specified in the standard. The construction of the meter shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of the wiring, screws, etc. The meter shall not produce appreciable noise in use.

6.05 The meter shall be projection type, dust and moisture proof. The meter base & cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. Meter Base shall be opaque and top cover shall be transparent/Opaque with transparent window top cover. The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust, moisture & vermin, but without suction in the meter.

6.06 **METER CASE**

The base and cover shall be ultra-sonically welded (continuous welding) / chemically welded so that once the meter is manufactured and tested at factory, it shall not be possible to open the cover at site except the terminal cover and any non-permanent deformation cannot prevent the satisfactory operation of the meter. The components shall be reliably fastened and secured against loosening. The manufacturer shall put at least one seal on meter body before dispatch. The thickness of material for meter body shall be 2 mm minimum. The holding on and sealing screws shall be held captive in the meter cover. The meter shall have a durable and substantially continuous enclosure made wholly of insulating material, including the terminal cover which envelopes all metal parts.

6.07 **TERMINALS & TERMINAL BLOCK**

6.07.1 The terminal block shall be made from high quality non-hygroscopic, fire retardant, reinforced polycarbonate (non-Bakelite) which shall form an extension of the meter case.

6.07.2 The material of which the terminal block is made shall be capable of passing the tests given in IS 1336O (Part 6/Sec 17) for a temperature of 135^0C and a pressure of 1.8 MPa (Method A). The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

6.07.3 The conductors where terminated to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the meter shall screw into a metal nut. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

6.07.4 Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

6.07.5 Two screws shall be provided in each current terminal for effectively clamping the external leads or thimbles. Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall be such as not to pierce and cut the conductors used

6.07.6 The minimum internal diameter of terminal hole shall be as per relevant IS.

6.07.7 The terminals, the conductor fixing screws or the external or internal conductors shall not be liable to come into contact with terminal covers.

6.07.8 The termination arrangement shall be extended type 6.5.2 of IS: 13779 / 1999 of the latest version irrespective of rear connections.

6.07.9 The manufacturer shall ensure that the supporting webs between two terminals of the terminal block shall be sufficiently high to ensure that two neighboring terminals do not get bridged by dust and there shall not be any possibility of flash over between adjacent terminals of the terminal block.

6.07.10 The construction of the meter shall be suitable for its purpose in all respects and shall be given reasonable assurance of continuous performance in all mechanical, electrical and magnetic adjustments. The construction shall be such that the meter is not prone to produce audible noise in use. The meter terminal cover shall be of injection

molded in transparent UV stabilized polycarbonate in a natural transparent colour.

Polycarbonate material of only following manufacturers or equivalent material shall only be used:

a) GE PLASTICS LEXAN 143R/143A/943AA FOR COVER AND TERMINAL COVER

b) BAYER GRADE CORRESPONDING TO ABOVE

c) DOW CHEMICALS ------do --------

d) MITSUBISHI ------do --------

e) TEJIN ------do --------

The meter base shall be manufactured from high quality industrial grade material viz. Polycarbonate with 10 % glass filled which shall meet following properties to ensure higher reliability and long life of the meter case.

7 A sticker label or rating plate information shall be laser marked containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than10 in red colour, which reads as "सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने विज नोंदणी होनार"

7.07 **TERMINAL COVER**

7.07.1 The termination arrangement shall be provided with an extended transparent terminal cover as per clause number 6.5.2 of IS: 13779 / 1999 of the latest version irrespective of rear connections.

7.07.2 The terminal cover of a meter shall be sealable independently of the meter cover to prevent unauthorized tampering.

7.07.3 The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

7.07.4 The fixing screws used on the terminal cover for fixing and sealing in terminal cover shall be held captive in the terminal cover.

7.07.5 When the meter is mounted, no access to the terminals shall be possible without breaking seals(s) of the terminal cover.

7.07.6 The terminal cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The terminal cover shall be transparent.

7.08 **RATING OF TERMINALS**

The terminals shall be of suitable rating and shall be capable of carrying 120% of Imax and made of electro-plated (or tinned) brass or Nickel plated brass and shall be of fixed type.

7.09 The provision shall be made on the meter for at least two seals to be put by utility user.

7.10 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non-ageing and of tested quality.

7.11 A capacitive touch button shall be provided for high resolution reading of display with three decimal digits as brought out elsewhere in this specification (optional) or meter should have facility to display high resolution energy values in Wh with resolution of 7 digits before decimal and 1 digits after decimal.

7.12 **RESISTANCE TO HEAT AND FIRE**

The terminal block, the terminal, the insulating material retaining the main contacts in position and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

The material of the terminal block shall not deflect under heating. To comply therewith, they must fulfill the tests as specified in 5.2.4 of IS: 15884 / 2010 of the latest version.

A capacitive touch button shall be provided for scrolling the parameters in Alternate Display (On Demand) mode.

7.13 **REAL TIME INTERNAL CLOCK (RTC)**

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 seconds per year. The calendar and the clock shall be correctly set to Indian Standard Time. The RTC shall have long life (minimum 10 Years) with Non rechargeable battery with battery life of minimum 10 years.

7.14 Meter memory shall have the following details.

- All the events history with time based and category based information,
- Monthly history and consumption data of the energy consumed for the last 12 months,
- All the limiting parameters shall also be available in meter reading

7.15 **RETENTION TIME OF THE NON-VOLATILE MEMORY**

For long outages, the payment meter shall be designed such that any data necessary for correct operation shall be retained for a minimum period of 10 years without an electrical supply being applied to the meter.

7.16 **OUTPUT DEVICE**

7.16.1 The meter shall have a test output device preferably with flashing red LED/LCD accessible from front and capable of being monitored with suitable testing equipment.

7.16.2 Output devices generally may not produce homogeneous pulse sequences. Therefore, the manufacturer shall state the necessary number of pulses to ensure that measurement uncertainty factor due to repeatability of meter is less than 1/10 of the error limits specified at different test points and consistent with desired resolution.

7.16.3 The resolution of the test output in the form of pulses of high resolution register, whether accessible on the meter through external display, shall be sufficient to conduct satisfactorily accuracy test at lowest test point defined in particular requirements in less than 5 min and starting current test in less than 10 min.

7.17 The meter accuracy shall not be affected by magnetic field from all sides of the meter i.e. front, sides, top and bottom of the meter.

7.18 There shall be one CT (in Neutral circuit) and one shunt (in phase circuit) or two CTs each in phase & neutral circuit or having shunt in phase and neutral circuit The current whichever is measured as higher either by CT or shunt shall be used for processing. The shunt shall be manganin based and e-beam welded for the construction purpose.

7.19 The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage / problems.

7.20 Power supply unit in the meter shall be transformer less to avoid magnetic influence.

7.21 Meter shall be tamper proof. No tampering shall be possible through optical port.

7.22 Display parameters in the meter shall not be accessible for reprogramming at site through any kind of communication.

7.23 Complete metering system & measurement shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech - report 325 (amended up to - date)

7.24 The measurement by meter shall not get influenced by injection of High frequency AC Voltage / chopped signal / DC signal and harmonics on the terminals of the meter.

7.25 The meter shall record and display total energy including Harmonic energy.

7.26 **SELF DIAGNOSTIC FEATURES**

7.26.1 The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.

7.26.2 The meter shall display unsatisfactory functioning / nonfunctioning / malfunctioning of Real Time Clock, battery. Display with Non rechargeable battery with battery life of minimum 10 years shall also be acceptable.

7.26.3 All display segments: "LCD Test" display shall be provided for this purpose.

7.27 **PRINTED CIRCUIT BOARD (WIRE / CABLE LESS DESIGN)**

The fully tested double layered glass epoxy shall be used. The latest technology such as hybrid microcircuit or application specific integrating circuit (ASIC) shall be used to ensure reliable performance. The mounting of components on the PCB shall be SMT (Surface Mounted Technology) Type. The electronic components used in the meter shall be of high quality from world renowned manufacturers

and there shall be no drift in accuracy of the meter for at least up to 5 ½ years.

The meter PCB shall be wireless to avoid improper soldering & loose connection / contact. The PCB material shall be Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm. It should be framed by A class vendor.

7.28 PCB used in meter shall be made by Surface Mounting Technology.

7.29 The meter shall be capable of being read through communication module and optical port.

7.30 **LATCHING RELAY (LOAD SWITCH)**

7.30.1 Meter shall have two latching relays for phase and neutral to protect the common tamper of phase and neutral interchanged, load through local earth, single wire tamper etc

7.30.2 The latching relay shall be bi-stable type latching switch designed and manufactured in accordance with international standard of IEC and DIN EN 61810 part 1 / VDE 0435 part 201 as well as they shall meet the overload and short circuit requirement of IEC, DIN EN 61036 / 61037 & ANSI C12. The Latching relay shall confirm to the load switching capabilities as per relevant IS. The latching relay shall be with trip-free design as given in IS.

7.30.3 Precautionary measures shall be taken to protect the latching relay from adverse effects resulting from the ingress or vermin into the payment meter.

7.30.4 The latching relay shall be designed and rated to make and break at Vref, Imax with a linear resistive load and at Vref, Ib, 0.4 inductive power factor for 3,000 operations.

7.30.5 Latching relay should connect and disconnect supply according to signal received from Head End System (HES).

7.30.6 Once the load is interrupted after receipt of disconnect command from Head End System (HES), the latching relay should only be operable to restore the load after further appropriate connect command from Head End System (HES) or optical port.

7.31 The meter shall be able to disconnect the load in case of exceeding the current limit (120% I_{max}) immediately on stabilizing the current.

7.32 **ENCLOSURE OF METER**

As per Annexure – III

7.00 METERING PROTOCOL

As per IS: 15959/2011 (Part-I) and IS:15959/2016 (Part-II) with latest amendments.

8.00 TOD TIMING

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable. At present the time zones shall be programmed as below.

Zone A (TZ1): 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs

Zone B (TZ2): 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs

Zone C (TZ3): 09=00 Hrs. to 12=00 Hrs.

Zone D (TZ4): 18=00 Hrs. to 22=00 Hrs.

9.00 MAXIMUM DEMAND INTEGRETION PERIOD

The maximum demand integration period shall be set at 30 minute as per Block Window Method.

10.00MD RESET

It shall be possible to reset MD by the following options:

Auto reset at 24:00 hrs at the end of each billing cycle: Automatic reset at the end of certain predefined period (say, end of the month). No push button shall be provided for MD reset.

11.00 PREPAID FEATURES

a. Disconnection Mechanism:

Meter should support disconnection under following conditions:

i. Over current
ii. Load Control Limit (Programmable and set by MSEDCL)
iii. Pre-programmed event conditions
iv. Disconnection signal from Head End System (HES) (Remote disconnection on demand) or from optical port.

b. Reconnection Mechanism:

Meter should support reconnection under following conditions:

i. Local reconnection due to disconnection under over current & load control limit.
ii. Remote reconnection, after receipt of command from Head End System (HES)
iii. Reconnection after receipt of command through optical port.

12.00 ANTI TAMPER FEATURES & TAMPER EVENTS

The meter shall detect and register the energy correctly only in forward direction under any one or combination of following tamper conditions:

12.01 Reversal of phase & neutral.

12.02 Reversal of line and load terminals.

12.03 Load through local Earth

12.04 The meter shall work accurately without earth.

12.05 Where neutral is disconnected from the load side or from the supply side or both, the load and supply side, the meter shall disconnect the load from supply side as well as from the load side.

12.06 All the above tampers will be verified at basic current at reference voltage.

The potential link shall not be provided on terminal block outside the main meter cover.

Visual indication shall be provided to show tamper conditions stated above in capacitive touch button mode.

12.07 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

12.08 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping and the meter shall continuously display that the cover has been tampered. It is suggested that the manufacturer shall develop their software such that there will be some time delay for activation of this tamper feature and during that period only the meter cover shall be fitted. The delay in activation of software shall be for one instance only.

After the meter cover is fitted, it shall get activated immediately without any delay. The delay in activation of software shall be for one instance only.

12.09 The energy meter shall have the facility to detect the above tampers stored in meter tamper data

12.10 The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 for EMI/EMC of IS 16444:2015 amended up to date. The meter shall remain immune for any higher signals than the present standards and MSEDCL technical specifications as indicated above.

12.11 Tamper indications to be displayed on LCD display to be defined by suppliers.

13.00 DISPLAY OF MEASURED VALUES

13.01 The display shall be permanently backlit LCD, visible from the front of the meter. The display shall be electronic and when the meter is not energized, the electronic display need not be visible.

13.02 **MINIMUM CHARACTER SIZE:**

The energy display shall be minimum 5 digits. The height of the display characters for the principal parameters values shall not be less than 3.4 mm. The size of digit shall be minimum 8.5 x 3.4 mm and legible enough to view from distance.

13.03 The principal unit for the measured values shall be the kilowatt hour (kWh) and the maximum demand in kW (kWMD) along with the time.

13.04 The decimal units shall not be displayed for cumulative kWh in auto scroll mode. However it shall be displayed in capacitive touch button mode for high resolution display for testing.

13.05 The meter shall be pre-programmed for following details.

Voltage: 240 V

Integration period for kWMD shall be of 30 minutes real time based.

The meter shall auto reset kW maximum demand (KWMD) at 2400 Hrs. of last day of each calendar month and this value shall be stored in the memory along with the cumulative kWh reading. No reset push button shall be provided.

The Default Display (Auto scrolling mode) shall switch to Alternate Display (On Demand Display Mode) after pressing the capacitive touch button continuously for 5 seconds.

The Alternate Display (On Demand Display Mode) shall switch over to Default Display if the capacitive touch button is not operated for 15 seconds.

13.06 The meter shall have facilities to measure, record and display the parameters as per IS: 16444/2015 & IS: 15884 / 2010 of the latest version.

Meter communication shall comply as per IS: 16444/2015 of the latest version.

Where multiple values are presented by a single display, all relevant values shall be available via appropriate selection (choice of selection shall be general, for example keypad or capacitive touch button).

13.07 The register shall be able to record and display starting from zero, for a minimum of 1500 h, the energy corresponding to maximum current at reference voltage and unity power factor. The register shall not rollover during this duration.

13.08 **DISPLAY INDICATORS:**

The following shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the prepaid meter.

a. Supply indication.
b. Relay status.
c. Earth load indication (if condition occurred).
d. Meter cover forcibly open tamper event.

The meter shall be provided with LED/LCD to indicate communication in progress. Two separate LED/LCD indicators should be provided for data transmission (TxD) mode and data receiving (RxD) mode or have two separate LCD indication for WAN and HAN is accepted. Optionally, indicators for mode of data transmission (TxD, RxD) shall be available on communication module.

13.09 The display parameters shall be preprogrammed at factory.

13.10 **MINIMUM DISPLAY CAPABILITY (MEASURING PARAMETERS):**

(A) DEFAULT DISPLAY (AUTO SCROLL MODE):

The following parameters shall be capable of being displayed on the Smart (Prepaid) metering default display (auto scroll mode).

(a)	Active Energy Cumulative kWh

(B) ALTERNATE DISPLAY (ON DEMAND DISPLAY MODE) (CAPACITIVE TOUCH BUTTON MODE):

The following parameters shall be capable of being displayed by Smart (Prepaid) meter in alternate display by capacitive touch button

(a)	Date & time
(b)	LCD check
(c)	Sr. No. of meter
(d)	Instantaneous Voltage
(e)	Instantaneous Current
(f)	High Resolution kWh with two decimal points
(g)	Software version of meter
(h)	Power ON Hours
(i)	No. of switch open or close operations
(j)	Maximum current & load limit set in meter
(k)	Maximum current recorded
(l)	kWMD information along with date & time
(m)	Consumption history for last 12 months (kWh).

(n)	Tamper Events
(o)	Meter Cover Open Tamper Event

14.00 BILLING DATA,BILLING HISTORY, LOAD SURVEY & TAMPER DATA

14.01 BILLING DATA

The billing data is summarized as below.

Sr. No.	Parameters
1.0	Real Time Clock- Dafte & Time
2.0	Cumulative Energy – kWh
3.0	Cumulative Energy – kWh for TZ1
4.0	Cumulative Energy – kWh for TZ2
5.0	Cumulative Energy – kWh for TZ3
6.0	Cumulative Energy – kWh for TZ4
7.0	Cumulative Energy – kVAh
8.0	Cumulative Energy – kVAh for TZ1
9.0	Cumulative Energy – kVAh for TZ2
10.0	Cumulative Energy – kVAh for TZ3
11.0	Cumulative Energy – kVAh for TZ4
12.0	Maximum demand (kW MD) with date & time.
13.0	Maximum demand (kW MD) with date & time for TZ1.
14.0	Maximum demand (kW MD) with date & time for TZ2.
15.0	Maximum demand (kW MD) with date & time for TZ3.

16.0	Maximum demand (kW MD) with date & time for TZ4.
17.0	Billing Power ON Duration in Minutes (During billing period)

14.02 **BILLING HISTORY:**

The meter shall have sufficient non-volatile memory for recording history of billing parameters as per above table for last 12 months.

14.03 **INSTANTANEOUS PARAMETERS:**

Instantaneous parameters are summarized as below.

Sr. No.	Parameters
1.0	Real Time Clock- Date & Time
2.0	Voltage
3.0	Phase Current
4.0	Neutral Current
5.0	Signed Power Factor
6.0	Cumulative Energy – kWh
7.0	Cumulative Energy – kVAh
8.0	Maximum demand (kW MD)
9.0	Cumulative Power ON Duration in Minutes
10.0	Cumulative Tamper Count
11.0	Cumulative Billing Count
12.0	Relay (Load Switch) Status

14.04 **LOAD SURVEY PARAMETERS:**

The load survey parameters shall be as given below.

(1)	Real Time Clock – Date and Time
(2)	Average Voltage

(3)	Block Energy – kWh
(4)	Block Energy – kVAh

The logging interval for load survey shall be 30 minutes. Load survey data shall be logged for 45 'Power On' days on non time based basis, i.e. if there is no power for more than 24 hours, the day shall not be recorded, however if there is no power for few block within one day those block should be displayed with 0 values with marking of power fail indication for that block i.e. for every day when there was power on, **the meter must record 48 blocks.** Whenever meter is taken out and brought to laboratory the load survey data shall be retained for the period of actual use of meter. This 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.

14.05**TAMPER DATA:**

The meter shall record the tamper events as specified in the specification. The meter shall keep records for the minimum 100 events. (Occurrence+ Restoration). For these abnormal conditions, the recording of events shall be on FIFO basis.

Event data should be immediately pushed by the meter to Head End System (HES) on occurrences and restorations of events. Also it shall be possible to retrieve the abnormal event data along with all related snap shots data through optical port and upload the same to Head End System (HES)

15.00 DEMONSTRATION

The purchaser reserves the right to ask for the demonstration of the equipment offered at the purchaser's place.

16.00CONNECTION DIAGRAM AND TERMINAL MARKINGS

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the

above diagram. The diagram & terminal marking on sticker will not be allowed.

17.00ACTIVITIES WITHIN SCOPE OF SOLUTION PROVIDER

Meter manufacturer/solution provider has to provide complete solution to comply requirements stated above. The solution provider will be responsible for all activities such as supply and installation of meters, maintenance and replacement of faulty meters.

List of activities within scope of solution provider are as follows:

a. Supply and installation of meters.

b. Deployment of Head End System (HES) & Meter Data Management System (MDM) on cloud.

c. Setting up data connectivity between meters and Head End System (HES).

d. Provision of remote monitoring and controlling of Head End System (HES) & Meter Data Management System (MDM).

e. Maintenance of entire network with defined SLAs.

f. Smart (Prepaid) meter data should be made available in case of failure of network.

g. Adequate staff for support and maintenance.

Facility management charges will be paid monthly. Successful bidder has to submit the duly signed invoices to Chief Engineer (MM Cell) showing number of meters communicated and not communicated with server in every month.

18.00MARKING OF METER

18.01NAME PLATE

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standard. The manufacturer's meter constant shall be marked on the Name Plate.

In addition to the requirement as per IS, following shall be marked on the Name Plate.

Purchase Order No.

Month and Year of manufacture

Name of purchaser i.e. MSEDCL

Guarantee as per tender document

ISI mark

Communication Technology : 6LoWPAN LPRF with DCU or GPRS/GSM or NB IoT or LoRa or PLC

The meter Serial No. shall be Bar Coded along with Numeric No. The size of Bar Code shall not be less than 20x5 mm. Stickers for meter serial no., in any case will not be accepted.

A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than 10 in red colour, which reads as**"**सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने वीज नोंदणी होणार."

19.00TESTS

19.01 TYPE TESTS

The Smart (Prepaid) meter to be supplied shall be fully type tested for the properties / requirement as per IS 16444/2015 and all relevant IS and IEC of the latest version and external AC / DC magnetic influence tests as per CBIP Tech - Report 325 with latest amendments. The Type Test Certificate as per IS: 16444 / 2015 & valid BIS certificate of Smart Meter shall be submitted along with offer & got approved before commencement of supply. Type test certificate of a meter shall be provided separately for each type of pluggable communication module (make wise) offered in a tender. Type test certificate shall not be more than 5 years old at the time of commencement of supply. The Type Test Reports shall clearly indicate the constructional features of the type tested meter.

All the Type Tests shall have been carried out from Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, Bangalore / Bhopal, ERDA Vadodara, ERTL to prove that the meter to be supplied meets the requirements of the specification. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable. Type Test for prepaid features as per IS shall be confirmed for the parameters indicated elsewhere in the specification also at manufacturers' lab during inspection.

All the type test reports including additional acceptance tests of meter to be supplied shall be got approved from Chief Engineer, Quality Control & Testing section before commencement of supply.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost.

19.02 Meters to be supplied shall pass the entire acceptance and routine test as laid down in IS: 16444/2015 & IS: 15884 / 2010 of the latest version and also additional acceptance tests as prescribed in this specification. (3 to 8 meter from a lot more than 1,000 shall be sealed randomly in the factory and will be tested for tamper events.

19.03 **ADDITIONAL ACCEPTANCE TESTS:**

The following additional tests on meter to be supplied shall be carried out in addition to the acceptance tests specified in IS: 16444/2015 & IS: 15884 / 2010 of the latest version.

(a) ACCEPTANCE TEST FOR PREPAID FEATURES:

i) Test of disconnect the output supply after receipt of disconnect signal from HES.

ii) Test of reconnect the output supply after receipt of connect signal from HES.

iii) Test of disconnect output supply if load / current exceeded the pre-set value in the meter.

iv) Test of reconnect output supply if load / current falls below the pre-set value in the meter.

(b) OTHER ACCEPTANCE TESTS:

i) Glow wire testing for polycarbonate material.

ii) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440V between phase and neutral without damage/problems,

iii) Tamper conditions as stated in this specification,

iv) Power consumption tests,

v) The meter to be supplied shall comply all the tests for external AC / DC magnetic field as per CBIP Tech Report 325 with latest

amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. If the accuracy of the meter gets affected during the test, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor. After removal of magnet, meter shall be subjected to accuracy test as per IS: 16444/2015 of the latest version. No deviation in error is allowed in the accuracy as per specifications.

vi) The meter shall withstand impulse voltage at 6 kV.

vii) The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 for EMI/EMC of IS 16444:2015 amended up to date. The meter shall remain immune for any higher signals than the present standards and MSEDCL technical specifications as indicated above

Jammer test for sample meters shall be carried out for immunity at MSEDCL's Testing Division as per CBIP

The test as per clause no. 19.03 (c) (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre-dispatch inspection.

The tests as per clause no. 19.03 (c) (v) ,(vi)& (vii) shall be carried out on one sample from first lot as per procedure laid down in IS: 16444/ 2015 of the latest version and CBIP Tech. Report - 325 in NABL LAB. The test report shall be got approved from Chief Engineer, Quality Control & Testing section before commencement of supply.

19.04 **LIMITS OF ERROR:**

Limits of variation in percentage error due to change in voltage shall not exceed the values given in the following table:

Sr. No.	Influence quantities	current Value	Power factor	Limits of variation in % error for class 1 meters
a)	Voltage variation – 15% to +10%	I_b I_b	1 0.5 lag	0.7 1.0
b)	Voltage variation – 40% & + 20%	I_b I_b	1 0.5 lag	1.1 1.5

(i) The meter shall be tested at (-) 15% and at (-) 40% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and

shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.

(ii) For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS: 16444 / 2015 of the latest version.

20.00GUARANTEED TECHNICAL PARTICULARS

The tenderer shall also furnish the particulars giving specific required details of Meter in schedule `A' attached. The offers without the details in Schedule 'A' stands rejected.

21.00TENDER SAMPLE

As per tender document.

22.00PRE DESPATCH INSPECTIONS

All acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The Company's representative / Engineers attending the above testing shall carry out testing on suitable number of meters as per sampling procedure laid down in IS: 15884 / 2010 of the latest version and additional acceptance test as per this specification and issue a test certificate approval to the manufacturer and give clearance for dispatch. All the meters offered for inspection shall be in sealed condition. The seals of sample meter taken for testing & inspection shall be break open & resealed after inspection. The routine tests of latching relay shall also be carried out &confirmed. The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer, Inspection Wing.

23.00INSPECTION AFTER RECEIPT AT STORES (RANDOM SAMPLE TESTING)

For carrying out "Random Sample Testing (RST), the sample meter will be drawn from any one of the stores against inspected lot and same

shall be tested at respective Testing and Quality Assurance units at Aurangabad, Bhandup, Kolhapur, Nagpur, Nashik & Pune. Sample meter shall be drawn as per Appendix "H" of IS: 13779 / 1999 (amended up to date). Sample meter will be tested by MSEDCL Testing Engineer in presence of supplier's representative jointly for (i) starting current, (ii) Limits of error, (iii) Repeatability of error, (iv) No Load Test as per IS: 16444 / 2015 of the latest version(v) Test for prepaid feature as per clause no. 22.03 (a). The RST shall be carried out by the Testing Division allotted by Chief Engineer, MM Cell.

The 5 days advance intimation shall be given to the supplier and if the supplier fails to attend the joint inspection on the date informed, the testing will be carried out by our testing engineer in absence of supplier's representative. If the meter fails in above random sample testing, the lot will be rejected.

24.00TRAINING

The bidder / manufacturer shall arrange various training programmes for administration training, user training and trouble shoot training free of cost with supported documents like system software manual, system operation manual. Training shall be imparted to at least 100 officers for user training and at least 5 officers for administration training.

25.00GUARANTEE

The prepaid meters with communication module and allied software / hardware shall be guaranteed for the period as per tender document. The Smart (Prepaid) meter with communication module and allied software / hardware found defective within above guarantee period shall be replaced by the supplier free of cost, within one month of receipt of intimation. If defective meter are not replaced within the specified period as above, the Company shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier. During the guarantee period, software changes required (e.g. tariff changes, any other statutory changes etc.) are to be implemented by the vendor free of cost. The meter vendor shall give the guarantee of the meter and allied software / hardware as per the tender conditions and also observe the performance of the meter on site for a period of at least one year and monitor the accuracy of the same independently & submit a report of the same.

26.00PACKING

26.01 The Smart (Prepaid) meter with communication module etc. shall be suitably packed in order to avoid damage during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit.

The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning.

The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

26.02 The following information shall be furnished with the consignment:

(i) Name of the consignee

(ii) Details of consignment

(iii) Destination

(iv) Total weight of the consignment

(v) Sign showing upper / lower side of the crate

(vi) Sign showing fragility of the material

(vii) Handling and unpacking instructions

(viii) Bill of Material indicating contents of each package and spare material.

27.00 QUALITY CONTROL

29.01 The purchaser has a right to send a team of experienced engineers for assessing the capability of the firm for manufacturing and testing of meters as per this specification.

The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

Meters supplied shall give service for a long period without drifting from original calibration & performance must be near to zero percent failure

28.00 MINIMUM TESTING FACILITIES

28.01 Manufacturer shall possess fully computerized automatic Meter Test Bench System having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly for carrying out routine and acceptance Tests as per IS:

16444 / 2015 & 15884 / 2010 of the latest version. Test Reports for each and every meter shall be generated. The list of testing equipments shall be enclosed.

28.02 The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests:

a) Insulation resistance measurement

b) No load condition

c) Starting current

d) Accuracy requirement

e) Power consumption

f) Repeatability of error

g) Tamper conditions - as per clause no. 12.00

h) Prepaid Feature Testing Facility as per clause no. 19.03 (a) & IS.

i) The manufacturer shall have duly calibrated RSS meter of class 0.1 or better accuracy.

j) The manufacturer shall have Glow Wire Testing facility

28.03 **METER SOFTWARE**

The Bidders will have to get appraised & obtain CMMI – Level III within one year from date of letter of award.

29.00 MANUFACTURING ACTIVITIES

The manufacturer shall submit the list of plant and machinery along with the offer.

A. Meter shall be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process. The loops/wired joints must be avoided on PCB. Further, the Bidder shall own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities.

B. Quality shall be ensured at the following stages:

a) At PCB manufacturing stage, each Board shall be subjected to computerized bare board testing.

b) At insertion stage, all components shall undergo computerized testing for conforming to design parameter and orientation

c) Complete assembled and soldered PCB shall undergo functional testing using Automatic Test Equipments (ATEs).

d) Important:

Prior to final testing and calibration, all meters shall be subjected to ageing test (i.e. Meters will be kept in heating chamber for 72 hours at 55^{O} C temperature at full load current. After 72 hours, meter shall work satisfactory) to eliminate infant mortality.

C. The calibration of meter shall be done in-house on a computerized testing bench having stabilized power supply.

D. The bidders shall submit the list of all (imported as well as indigenous) components to be used in meter, separately along with the offer. List of makes of components is attached herewith as a guide line (Annexure - II).

E. Bought out items:

A detailed list of bought out items which are used in the manufacturing of the meter, shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

F. List of Plant and Machinery used for Energy meter Production.

Sr. No.	**List of Plant and Machinery used for Energy meter Production**	
1	Fully automatic testing Bench with ICT for testing link less meter	Routine Testing and Calibration of Meter
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meter
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing

6	Long duration Running test set ups	Reliability Testing
7	Reference Meter class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meter
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life

		cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meter
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meter
30	Short term over Current testing setup	Type testing of Meter
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meter
33	Composite Environmental testing chambers	Type testing of Meter

30.00 QUALITY ASSURANCE PLAN

30.01 The tenderer shall invariably furnish QAP as specified in Annexure - I along with his offer the QAP adopted by him in the process of manufacturing.

30.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

31.00COMPONENT SPECIFICATION

As per Annexure - II enclosed.

32.00SCHEDULES

The tenderer shall fill in the following schedules and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule `A' .... Guaranteed Technical particulars (As per parameters uploaded on e - Tendering site.)

The discrepancies if any between the specification and the catalogs and/or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

If it is observed that there are deviations in the offer in Guaranteed Technical Particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

ANNEXURE - I

Quality Assurance Plan

A. The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i. Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates :

ii. Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii. List of manufacturing facilities available.

iv. Level of automation achieved and list of areas where manual processing exists.

v. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi. List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

B. The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i. List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offers.

ii. Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii. Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C. The contractor shall operate systems which implement the following:

i. Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental

approval of designated individuals organizations. The purchaser's written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

ii. Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

D. The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i. The structure of the organization.

The duties and responsibilities assigned to staff ensuring quality of work.

The system for purchasing taking delivery and verification of material.

The system for ensuring quality workmanship.

The system for retention of records.

The arrangement for contractor’s internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii. Quality Plans :

An outline of the proposed work and programme sequence.

The structure of the contractor's organization for the contract.

The duties and responsibilities assigned to staff ensuring quality of work.

Hold and notification points.
Submission of engineering documents required by the specification.
The inspection of materials and components on receipt.
Reference to the contractor's work procedures appropriate to each activity.

Inspection during fabrication / construction.

Final inspection and test.

ANNEXURE - II

Component Specification

The make/grade and the range of the components should be from the following list **or equivalent reputed makes**.

Sr. No.	Component function	Requirement	Makes
1	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type.	**USA:** Analog Devices, Cyrus Logic, Atmel, Philips, Teridian. Dallas, ST, Texas Instruments, Motorola, Maxim, National Semiconductors, Freescale, Onsemiconductors **Germany:** Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria:** AMS **Holland:** Philips (N X P) **Taiwan:** Prolific
2	Memory chips	The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. Meter shall have non volatile memory (NVM). No other type of memory shall be used for data recording and programming. (The life of the NVM is highest) There shall be security isolation between metering circuit, communication circuit, and power circuit.	**USA:** Atmel, Teridian, National Semiconductors, Philips, Texas Instruments, ST, Microchip, Spanson (Fujitsu), Ramtron **Japan:**Hitachi, Renasas **Germany:** Siemens

3	Display modules	a) The display modules shall be well protected from the external UV radiations. b) The display visibility shall be sufficient to read the Meter mounted at height of0.5 meter as well as at the height of 2 meters (refer 3.2 d for viewing angle). c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type). d) It shall be trans-reflective HTN (HTN – Hyper Twisted Nematic (120°)) or STN (STN – Super Twisted Nematic (160°)) type industrial grade with extended temperature range. HTN – Hyper Twisted Nematic (120°) STN – Super Twisted Nematic (160°)	Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics **Singapore:** E-smart, Bonafied Technologies, Display Tech, **Korea:**Advantek, Jebon, Union Display Inc., **Japan:** Hitachi,Tianma, Sony, L&G, Holtek, Haijing. **Malaysia:** Crystal Clear Technology. **Hong kong:** Genda **China:** Success, Tianma
4	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** National Semiconductors, Atmel, Philips, TexasInstruments,BC Component Analog devices, ST, Maxim, Siemens, PHYCOMP, YAGEO, DRALORIC, KOA, WELWYN, OSRAM,KemetOnsemiconductors, Freescale, Intersil, Raltron, Fairchild, Muruta, Agilent, AVX,

			Abracon, Sipex, Diode Inc., Honeywell, Power Integration, Fox, Roham **Japan:** Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung, Panasonic **India:**Keltron, Incap, VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic components Pvt. Ltd., Cermet, CTR. **Korea:** Samsung **Germany:** Vishay, Epcos, Diotech, Kemet, Infineon **Taiwan:**Yageo
5	Battery	Only non rechargeable battery shall be used for RTC as well as display in absence of Power since the life & Reliability of these are better than the rechargeable batteries.	**USA:** Maxell, Renata **Japan:** Panasonic, Sony, Mitsubishi, Sanyo **Germany:** Varta, Tedirum **France:** Saft **Korea:** Tekcell, Vitzrocell

SCHEDULE 'A'

GUARANTEED TECHNICAL PARAMETERS

ITEM NAME	LT AC SINGLE PHASE, 10-60 OR 5- 60 AMPS SMART (PREPAID/POSTPAID) STATIC ENERGY METER AS PER IS: 16444 - 2015 WITH PLUG IN TYPE COMMUNICATION MODULE FOR USE ON LT CONSUMER INSTALLATIONS		
SR. NO.	**GUARANTTED TECHNICAL PARAMETERS**	**MSEDCL REQUIREMENT**	**OFFERED BY THE BIDDER**
1.0	MAKE & TYPE	TO BE FILLED BY MANUFACTURER	
2.0	APPLICABLE STANDARD	IS 16444/2015 & CBIP 325 (AMENDED UPTO DATE)	
3.0	ACCURACY CLASS	1.00	
4.0	METER BEARS ISI MARK	YES	
5.0	RATED VOLTAGE	240 V	
6.0	VOLTAGE RANGE	(-) 40% TO (+) 20% OF RATED VOLTAGE	
7.0	FREQUENCY	50 HZ +/- 5%	
8.0	RATED BASIC CURRENT (Ib)	5 or 10 AMPS	
9.0	MAXIMUM CONTINUOUS CURRENT IMAX	60 AMPS	
10.0	METER WORKS ACCURATELY UPTO 120% OF IMAX (i.e. 72 AMPS)	YES	
11.0	STARTING CURRENT.	0.2 % of Ib	

12.0	POWER CONSUMPTION IN VOLTAGE CIRCUIT	AS PER IS16444	
13.0	POWER CONSUMPTION IN CURRENT CIRCUIT	AS PER IS16444	
14.0	POWER FACTOR ZERO TO UNITY	(ALL LAG OR LEAD)	
15.0	STANDARD REFERENCE TEMPERATURE FOR PERFORMANCE IS 27^{O}C	YES	
16.0	MEAN TEMPERATURE CO-EFFICIENT	DOES NOT EXCEED 0.07%	
17.0	TEMPERATURE RISE IS AS PER IS: 16444 / 2015 OF THE LATEST VERSION.	YES	
18.0	OPAQUE METER BASE & TOP COVER IS TRANSPARENT /OPAQUE WITH TRANSPARENT WINDOW MADE OF UNBREAKABLE, TOUGH, HIGH GRADE, FIRE RESISTANT POLYCARBONATE MATERIAL	YES	
19.0	METER BODY TYPE TESTED FOR IP 51 DEGREE OF PROTECTION AS PER IS 12063	YES	
20.0	THERMAL HEAT DISTORTION TEMPERATURE VALUE	MIN. 128° C	
21.0	FLAMMABILITY	CLASS V2	
22.0	GLOW WIRE TEST AT 650° C	TO BE FILLED BY MANUFACTURER	
23.0	TENSILE STRENGTH	TO BE FILLED BY MANUFACTURER	
24.0	FLEXURE STRENGTH	TO BE FILLED BY MANUFACTURER	

25.0	MODULUS OF ELASTICITY	TO BE FILLED BY MANUFACTURER	
26.0	IZOD IMPACT STRENGTH NOTCHED 23° C	TO BE FILLED BY MANUFACTURER	
27.0	FURNISH PHYSICAL WATER ABSORPTION VALUE	MAX 0.30	
28.0	TERMINAL BLOCK IS MADE FROM HIGH QUALITY NON-HYGROSCOPIC, FIRE RETARDANT, REINFORCED POLYCARBONATE (NON-BAKELITE)	YES	
29.0	MATERIAL OF WHICH TERMINAL BLOCK IS MADE IS CAPABLE OF PASSING TESTS GIVEN IN IS: 1336O (PART 6/SEC 17) FOR A TEMPERATURE OF 135^0 C AND A PRESSURE OF 1.8 MPA (METHOD A) .	YES	
30.0	EXTENDED TRANSPARENT TERMINAL COVER IS AS PER CLAUSE NUMBER 4.2.5 OF IS: 15884 / 2010 OF THE LATEST VERSION	YES	
31.0	TRANSPARENT TERMINAL COVER IS SEALABLE INDEPENDENTLY	YES	
32.0	PROPER SIZES OF GROOVES ARE PROVIDED AT BOTTOM OF TERMINAL COVER	YES	
33.0	METER BASE & COVER ARE ULTRA-SONICALLY WELDED / CHEMICALLY WELDED (CONTINUOUS WELDING)	YES	
34.0	THICKNESS OF MATERIAL FOR METER	2 MM MINIMUM	
35.0	SCREWS USED ON TERMINAL COVER FOR FIXING & SEALING IN TERMINAL COVER ARE HELD CAPTIVE IN TERMINAL COVER	YES	

36.0	TERMINALS ARE OF SUITABLE RATING & ARE CAPABLE OF CARRYING 120% OF IMAX & MADE OF ELECTRO-PLATED (OR TINNED) BRASS & ARE OF REPLACEABLE TYPE.	YES	
37.0	TERMINAL BLOCK, TERMINAL COVER, INSULATING MATERIAL RETAINING MAIN CONTACTS IN POSITION & METER CASE ENSURE REASONABLE SAFETY AGAINST SPREAD OF FIRE. THEY DO NOT IGNITE BY THERMAL OVERLOAD OF LIVE PARTS IN CONTACT WITH THEM.	YES	
38.0	MATERIAL OF TERMINAL BLOCK DOES NOT DEFLECT UNDER HEATING &. TO COMPLY THEREWITH, FULFILLS TESTS SPECIFIED IN 5.2.4 OF IS: 15884 / 2010 OF THE LATEST VERSION.	YES	
39.0	RTC PRE-PROGRAMMED FOR 30 YEARS DAY / DATE	YES	
40.0	MAXIMUM DRIFT OF RTC	SHALL NOT EXCEED +/- 300 SECONDS PER YEAR	
41.0	RTC HAS LONG LIFE OF 10 YEARS	YES	
42.0	PROVISION TO PUT AT LEAST TWO SEALS ON METER	YES	
43.0	METER MEMORY HAS DETAILS AS PER CLAUSE NO. 6.16	YES	
44.0	NON-VOLATILE MEMORY IS FOR A MINIMUM PERIOD OF 10 YEARS	YES	
45.0	OPERATION INDICATOR PROVIDED IN THE FORM OF BLINKING LED / LCD	YES	

46.0	RESOLUTION OF TEST OUTPUTIS SUFFICIENT TO CONDUCT SATISFACTORILY ACCURACY TEST AT LOWEST TESTPOINTIN LESS THAN 5 MIN & STARTING CURRENT TEST IN LESS THAN 10 MIN.	YES	
47.0	METER CONSTANT INDELIBLY PROVIDED ON NAME PLATE	YES	
48.0	CAPACITIVE TOUCH BUTTONS ARRANGEMENT FOR HIGH RESOLUTION READING & SCROLLING THE PARAMETERS IN ALTERNATE DISPLAY (ON DEMAND) MODE	YES	
49.0	METER SHOULD MEET REQUIREMENTS OF CBIP 325 FROM EFFECT OF AC/DC MAGNERTIC FIELD FROM ANY SIDE OF METER	YES	
50.0	ONE CT IN NEUTRAL CIRCUIT & ONE MANGANIN BASED, E-BEAM WELDED SHUNT IN PHASE CIRCUIT OR TWO CTs PROVIDED	YES	
51.0	METER CAPABLE TO WITHSTAND PHASE TO PHASE VOLTAGE (440 V) IF APPLIED BETWEEN PHASE TO NEUTRAL FOR ATLEAST 5 MINS	YES	
52.0	POWER SUPPLY UNIT IS TRANSFORMER LESS	YES	
53.0	METER IS TAMPER PROOF & NO TAMPERING IS POSSIBLE THROUGH OPTICAL PORT.	YES	

54.0	DISPLAY PARAMETERS IN METER ARE NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION.	YES	
55.0	COMPLETE METERING SYSTEM & MEASUREMENT NOT AFFECTED BY EXTERNAL ELECTROMAGNETIC INTERFERENCE AS PER CL. NO. 6.25 OF TECH. SPECS.	YES	
56.0	METER MEETS REQUIREMENT OF CBIP TECH. REPORT 325 (AMENDED UP TO DATE) MAGNET TEST	YES	
57.0	MEASUREMENT BY METER DOES NOT GET INFLUENCED BY INJECTION OF HIGH FREQUENCY AC VOLTAGE / CHOPPED SIGNAL / DC SIGNAL AND HARMONICS ON THE TERMINALS OF THE METER	YES	
58.0	METER RECORDS AND DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY.	YES	
59.0	METER PCB IS WIRELESS	YES	
60.0	METER MANUFACTURED USING SURFACE MOUNTING TECHNOLOGY	YES	
61.0	METER IS CAPABLE OF BEING READ THROUGH PLUG IN TYPE COMMUNICATION MODULE.	YES	
62.0	COMMUNICATION MODULE USED IN METER	TO BE FILLED BY MANUFACTURER	
63.0	MAKE AND CHIP SET DETAILS OF COMMUNICATION MODULE USED IN METER	TO BE FILLED BY MANUFACTURER	

64.0	COMMUNICATION MODULE IS AS PER GENERAL REQUIREMENTS (SIZE, PIN DIAGRAM ETC.) GIVEN IN ANNEXURE-IV	YES	
65.0	COMMUNICATION MODULE IN METER IS ABLE TO PUSH METER DATA TO HEAD END SYSTEM AND RECEIVE COMMANDS FROM HEAD END SYSTEM	YES	
66.0	METERING PROTOCOL IS AS PER CLAUSE NO. 7.0	YES	
67.0	BI-STABLE TYPE & MANUFACTURED IN ACCORDANCE WITH INTERNATIONAL STANDARD OF IEC & DIN EN 61810 PART 1 / VDE 0435 PART 201, ONE LATCHING RELAY FOR PHASE AND NEUTRALIS PROVIDED .	YES	
68.0	LATCHING RELAY MEET OVERLOAD & SHORT CIRCUIT REQUIREMENT OF IEC, DIN EN 61036 / 61037 & ANSI C12 AND CONFIRM TO LOAD SWITCHING CAPABILITIES AS PER RELEVANT IS	YES	
69.0	LATCHING RELAY IS WITH TRIP-FREE DESIGN AS PER IS 15884/2010.	YES	
70.0	OPERATION OF LATCHING RELAY ON DISCONNECTION COMMAND SHALL BE FOR PHASE AND NEUTRAL.	YES	
71.0	LATCHING RELAY IS DESIGNED & RATED TO MAKE & BREAK AT VREF, IMAX WITH A LINEAR RESISTIVE LOAD AND AT VREF, IB, 0.4 INDUCTIVE POWER FACTOR FOR 3,000 OPERATIONS.	YES	
72.0	METER DISCONNECTS LOAD IN CASE OF EXCEEDING CURRENT LIMIT (120% IMAX) IMMEDIATELY ON STABILIZING THE CURRENT.	YES	

73.0	METER IS NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION FOR ANY ALTERATION IN THE FACTORY SETTINGS.	YES	
74.0	OPTICAL PORT PROVIDED FOR DATA DOWNLOADING	YES	
75.0	SEALING ARRANGEMENT FOR COMMUNICATION MODULE IS PROVIDED	YES	
76.0	OPTICAL SUPPORT DEFAULT & MINIMUM BAUD RATE OF 9600 BPS	YES	
77.0	TOD TIME ZONES PROVIDED	YES	
78.0	PROVISION TO SET MAXIMUM DEMAND INTEGRATION PERIOD AT 30 MINUTE AS PER REQUIREMENT.	YES	
79.0	AUTO RESET AT 24:00 HRS AT THE END OF EACH BILLING CYCLE OR AT THE END OF CERTAIN PREDEFINED PERIOD (SAY, END OF THE MONTH) IS PROVIDED	YES	
80.0	AN LED/LCD FOR POWER ON INDICATION IS PROVIDED.	YES	
81.0	LED/LCD PROVIDED FOR POWER ON INDICATION BLINKS DURING COMMUNICATION.	YES	
82.0	ALL ANTI-TAMPER FEATURES AS PER CLAUSE 12.00 ARE PROVIDED	YES	
83.0	PERMANENT BACKLIT LCD TYPE DISPLAY IS PROVIDED	YES	
84.0	5 NUMBER OF DIGITS FOR ENERGY DISPLAY PROVIDED	YES	
85.0	MINIMUM SIZE OF DIGITS	Minimum 8.5 x 3.4 mm	

86.0	METER PRE-PROGRAMMED FOR (a) 240 V	YES	
87.0	(b) INTEGRATION PERIOD OF 30 MIN FOR MD	YES	
88.0	(c) AUTO RESET KWMD AT 2400 HRS. OF LAST DAY OF EACH CALENDAR MONTH	YES	
89.0	(d) NO RESET PUSH BUTTON PROVIDED FOR MD RESET	YES	
90.0	DISPLAY INDICATORS BY LED / LCD PROVIDED AS PER CLAUSE NO. 13.08	YES	
91.0	PARAMETERS IN AUTO SCROLL MODE DISPLAYED FOR MINIMUM 10 SECONDS INCLUDING LCD CHECK.	YES	
92.0	DEFAULT DISPLAY SWITCHES TO ALTERNATE DISPLAY AFTER PRESSING THE CAPACITIVE TOUCH BUTTON CONTINUOUSLY FOR 5 SECONDS	YES	
93.0	ALTERNATE DISPLAY SWITCHES TO DEFAULT DISPLAY IF CAPACITIVE TOUCH BUTTON / PUSH BUTTON IS NOT OPERATED FOR 15 SECONDS	YES	
94.0	KWMD PROVIDED	YES	
95.0	METER HAS NON-VOLATILE MEMORY FOR RECORDING HISTORY OF BILLING PARAMETERS FOR LAST 12 MONTHS.	YES	
96.0	PROVISION FOR LOAD SURVEY FOR 30 MINUTES & FOR LAST 45 POWER ON DAYS FOR SPECIFIED PARAMETERS ON FIFO	YES	

97.0	METER RECORDS TAMPER EVENTS AS SPECIFIED IN SPECIFICATION.	YES	
98.0	METER KEEPS RECORDS FOR MINIMUM 100 EVENTS. (OCCURRENCE + RESTORATION) FOR ABNORMAL CONDITIONS ON FIFO BASIS.	YES	
99.0	IT IS POSSIBLE TO RETRIEVE ABNORMAL EVENT DATA ALONG WITH ALL RELATED SNAP SHOTS DATA THROUGH OPTICAL PORT	YES	
100.0	HEAD END SYSTEM IS ABLE TO RECEIVE AND STORE METER DATA PUSHED BY METERS	YES	
101.0	HEAD END SYSTEM IS ABLE TO SEND CONNECT/DISCONNECT SIGNAL TO COMMUNICATION MODULE IN METER ACCORDING TO METER NUMBERS RECEIVED FROM METER DATA MANAGEMENT SYSTEM (MDM)	YES	
102.0	METER DATA MANAGEMENT SYSTEM (MDM) IS SUPPORTING STORAGE, ARCHIVING, RETRIEVAL AND ANALYSIS OF METER DATA WITH VALIDATION AND VERIFICATION ALGORITHMS.	YES	
103.0	METER DATA MANAGEMENT SYSTEM(MDM) IS HAVING PREPAID ENGINE IS PERIODICALLY MONITORING ENERGY CONSUMPTION OF PREPAID METERS AND DECREASE AVAILABLE CREDIT BASED ON CONSUMPTION	YES	
104.0	PERMANENT NATURE CONNECTION DIAGRAM OF METER IS SHOWN ON INSIDE PORTION OF TERMINAL COVER	YES	

105.0	CLEARLY VISIBLE, EFFECTIVELY SECURED, INDELIBLY & DISTINCTLY MARKED NAME PLATE WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARD & SPECIFICATION IS PROVIDED	YES	
106.0	METER IS TYPE TESTED AS PER IS 16444 WITH ALL OFFERED COMMUNICATION TECHNOLOGY	YES	
107.0	GUARANTEE PERIOD AS PER TENDER DOCUMENT	YES	
108.0	TENDER SAMPLE METERS AS PER IS: 16444:2015 (AMENDED UPTO DATE) WITH EACH PLUG IN COMMUNICATION MODULE FOR CONNECTIVITY AS PER TECHNICAL SPECIFICATION WITH SEPARATE COMMUNICATION TECHNOLOGY ALONG WITH CONNECTORS IS SUBMITTED ALONGWITH OFFER. IT SHALL BE AS PER TENDER DOCUMENT	YES	
109.0	IN HOUSE TESTING FACILITIES ARE AVAILABLE FOR (a) INSULATION RESISTANCE MEASUREMENT	YES	
110.0	(b) NO LOAD CONDITION	YES	
111.0	(c) STARTING CURRENT TEST	YES	
112.0	(d) ACCURACY TEST REQUIREMENT	YES	
113.0	(e) POWER CONSUMPTION	YES	

114.0	(f) FULLY COMPUTERISED METER TEST BENCH SYSTEM FOR CARRYING OUT ROUTINE AND ACCEPTANCE TEST IS AVAILABLE	YES	
115.0	(g) MANUFACTURER HAS CALIBRATED STANDARD METER OF 0.1 CLASS ACCURACY	YES	
116.0	(h) VERIFIACTION OF DATA DOWNLOADING WITH PLUGGABLE MODEM	YES	
117.0	(i) GLOW WIRE TESTING	YES	
118.0	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	TO BE FILLED BY MANUFACTURER	
119.0	MANUFACTURING ACTIVITIES ARE AS PER CLAUSE 29.00	YES	
120.0	QAP SUBMITTED AS PER ANNEXURE-I	YES	
121.0	AGEING TEST IS CARRIED OUT ON METER	YES	
122.0	WHETHER YOU AGREE TO SUPPLY METERS AS PER ANEXURE-D, I.E. TECHNICAL SPECIFICATIONS OF THE TENDER.	YES	

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

METER BOX MADE OUT OF SHEET MOULDING COMPOUND (SMC) GRADE S3 SUITABLE FOR LT AC SINGLE PHASE 10 – 60 A OR WIDE RANGE SMART ENERGY METER

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1.00 SCOPE

This specification covers design, manufacturing, testing and supply of meter box made out of Sheet Moulding Compound (SMC) confirming to IS: 13410. The Meter Box shall be suitable for housing single phase energy meters on wall mounting in indoor as well as outdoor applications.

2.00 SERVICE CONDITIONS

The meter box to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions.

(a) Max. ambient temperature 50^0C

(b) Max. relative humidity 100%

(c) Max. annual rainfall 1450 mm (d)

Max. wind pressure 150Kg./ m^2 (e)

Max. altitude above mean sea level 1000 meters (f)

Seismic level (Horizontal acceleration) 0.3 g

(g) Ref. Ambient temperature for temperature rise 50^0C

(h) Isoceraunic level (days/year) 50

(i) Climatic condition: Moderately hot & humid tropical climate conducive to rust and fungus growth

3.00 APPLICABLE STANDARDS

Unless otherwise modified in this specification, the meter box shall generally confirm to IS: 14772 / 2020 (Amended up to date) and material of construction i.e. sheet moulding compound (SMC) shall confirm to IS: 13410 and requirement of this specification.

4.00 DESIGN & CONSTRUCTION:

4.01 The meter box shall be made from Thermosetting Plastic i.e. glass reinforced polyester sheet moulding compound (SMC) confirming to IS: 13410/ 1992, & requirement of this specification.

4.02 The meter box shall be so constructed as to have roof tapering down for easy flow of rainwater

4.03 The meter box shall be made of anti corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant S3 grade SMC material having good dielectric and mechanical strength property.

4.04 The surface appearance or part of meter box must be smooth, non porous and homogeneous, free from ripples, defects and marks. No fillers or fibres should be visible at any place.

4.05 The Meter Box shall be moulded using 100% virgin SMC, grade S-3 material. The box shall be weather proof, unbreakable and scratch resistant & shall have good workmanship. For SMC, the wall thickness of the meter box base shall be minimum 3 mm on load bearing side and 2 mm on all other sides, thickness of cover shall be minimum 2 mm

4.06 The meter box must be UV stabilized to ensure that it does not get 'Yellow' over a period of time. It should not change in colour, shape, size, dimensions when subjected to 200 hrs on UV ageing test as per ASTM: G53 (Cl. No. 9.3). Also, it shall be capable of withstanding temperature of boiling water for five minutes continuously without distortion or softening.

4.07 The minimum inside dimensions of the meter box shall be suitable for installation of all types of meters purchased from various meter manufacturers considering the clearances indicated elsewhere in this specification.

4.08 The meter box shall be made from thermosetting plastic i.e. glass reinforced polyester sheet moulding compound confirming to IS: 13410 /1992, Grade S3 & requirement of this specification.

4.09 Meter box should have base raised by about 10 mm in the box for easy wiring for fixing the meter. The meter screws shall not protrude outside.

4.10 The internal dimensions of single phase meter box shall be such that there should be minimum 60 mm clearance at the bottom, 40 mm clearance on all three sides, 25 mm clearance at the front and 10 mm clearance at the back between meter and meter box inner wall.

4.11 The tolerance permissible on the various dimensions of the meter box shall be 3%.(Negative tolerance not accepted)

4.12 The base and cover of meter box shall be individually in one piece

4.13 The box and cover shall be fixed by concealed stainless steel hinges and Hardware from inside in such a manner that it can't be manipulated from outside. The door shall have locking arrangement by way of door closing U Clamp of stainless steel material. The meter box base and cover shall have minimum 01 no of matching wire sealing holes for sealing purpose

4.14 The cover in closed position should be overlapped on base such that

direct entry of screwdriver, tool or film is not possible. The cover shall be provided with semi circular / circular gasket of sufficient size to completely fit to the base. The gasket should be made out of good quality neoprene rubber.

4.15 The meter box base and cover shall have minimum 2 nos. of matching wire sealing holes for MSEDCL sealing purpose.

4.16 Meter box shall confirm to IP-54(in case of without any gasket) and IP55.

4.17 Zinc passivated screws of sufficient sizes shall be provided inside the meter box for mounting the meters manufactured by various meter manufacturers.

4.18 4 nos. of keyholes of minimum diameter 5 mm shall be provided at the four corners at the backside of the meter box to facilitate mounting of the meter box on the wall or wooden board or pole.

4.19 2 nos. of holes with polymeric/rubber grommets; for securely fixing the cable; of maximum diameter of 6 or 8 mm shall be provided at the bottom of meter box for incoming and outgoing cables.

4.20 The thermal endurance of SMC shall be as per clause no. 6.8 of IS: 13410 /1992.

4.21 Colour of meter box shall be Siemens Grey

4.22 The cover shall be provided with viewing window of minimum size of 140 mm x 120 mm. shall be provided about 30 mm below Top edge of meter box to facilitate for meter reading. The glass shall be fixed from inside of the cover of meter box with anti-corrosive plastic frame

The triplex toughened glass of minimum 3 mm thickness shall be provided in the viewing window from inside of the cover for observing meter reading so that the glass cannot be removed from outside. It shall be so fitted that in the event of breaking, it shall be possible to replace it after opening the door. Sufficient holding arrangement for the glass in place shall be provided on the inside of meter box cover.

5.00 TESTS

5.01 The meter box shall be fully type tested as per IS 14772 / 2020 (amended up to date), IS: 13410 / 1992 and other relevant standards. The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per IS: 13410 / 1992 and other type tests as well as acceptance tests. All the Type Tests shall be carried out from Laboratories, which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA or CIPET, to prove that the meter box meets the requirements of specification. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable. The tenderer shall also furnish the

particulars giving specific required details of Meter boxes in schedule 'A' attached (As per Guaranteed Technical Particulars uploaded on e - Tendering site). The offers without the details in Schedule 'A' stand rejected. The tenderer shall submit all the type test reports as below along with offer. The type test report of meter box having identical constructional and other features carried out during last five years will be valid.

5.02 The meter box shall pass all the acceptance and routine tests as laid down in IS 14772/2020 (amended up to date) & IS: 13410 and also additional acceptance tests as prescribed in this specification.

Sr. No.	Test	Reference Standard
1	Marking	IS 14772:2020
2	Dimensions	IS 14772:2020
3	Protection against Electric Shock	IS 14772:2020
4	Provision for Earthing	IS 14772:2020
5	Construction	IS 14772:2020
6	Resistance to Ageing, to humid condition, to ingress of solid objects and to harmful ingress of water	IS 14772:2020
7	Mechanical Strength	IS 14772:2020
8	Density of Moulding, g/ml(*1.8 to 2.1)*	IS:13410-1992
9	Surface Resistivity (24 hrs in water), Ohm	IS:13410-1992
10	Volume Resistivity, Ohm-cm	IS:13410-1992
11	Impact Strength, KJ/m2	IS:13410-1992
12	Tensile Strength, MPa	IS:13410-1992
13	Power Arc Resistance, sec	IS:13410-1992
14	Heat Distortion Temperature, Deg. C	IS:13410-1992

5.03 Identifying material of construction and its grade / composition as per IS: 13410 and other type tests as well as acceptance tests shall be submitted for approval before commencement of supply.

5.04 **Type Tests for SMC Meter Box:**

Sr. No.	Test	Reference Standard	Required Value
1	Ratings	IS-14772:2020, Cl. 6	As per IS and specification
2	Classification	IS-14772:2020, Cl. 7	As per IS
3	Marking	IS-14772:2020, Cl. 8	Manufacturer Name & Danger Logo Screen Printing
4	Dimensions	IS-14772:2020, Cl. 9	As per specification and drawing
5	Protection against Electric Shock	IS-14772:2020, Cl. 10	As per IS
6	Provision for Earthing	IS-14772:2020, Cl. 11	As per IS
7	Construction	IS-14772:2020, Cl. 12	No Crack or Damage
8	Resistance to ageing, protection against ingress of solid objects and against harm full ingress of water	IS-14772:2020, Cl. 13	No Crack or Damage
9	Insulation resistance and electric strength	IS-14772:2020, Cl. 14	Insulation resistance shall be not less than 5 MΩ. No flashover or breakdown shall occur during the electrical strength test
10	Mechanical Strength	IS-14772:2020, Cl. 15	No Crack or Damage
11	Resistance to Heat	IS-14772:2020, Cl. 16	No ball impression
12	Creepage distance, clearance and distance through seating compound	IS-14772:2020, Cl. 17	As per IS
13	Resistance to insulating material to abnormal heat and fire	IS-14772:2020, Cl. 17	No Flame and Glowing
14	Resistance to Tracking	IS-14772:2020, Cl. 19	No failure or breakdown occurs before 50 Drops 175V
15	Resistance to corrosion	IS 14772:2020, Cl. 20	No sign of rust observed
16	Heat Deflection Temperature	IS 13411:1992	> 150 deg C
17	Exposure to Flame	IS 4249:1967	Self Extinguishing
18	Flammability	UL-94/IS-11731	V0
19	Melting Point	IS:13360 (Part-6/Sec-10):1992	Does not melt upto 400 deg C
20	Glow wire test at 960 Deg C	IS:11000	No flame and glowing observed
21	Ball Pressure Test	IEC-335	No Ball Impression Observed
22	UV Ageing Test for 200 Hours	ASTM-G-154	No Colour Change, no chalking and No discoloration observed
23	Water Absorption	IS:13411-1992	< 0.20%
24	Material Identification	As per Laboratory Method	Glass reinforced polyester Sheet Moulding compound

			(SMC)
25	Glass content, percent by mass (Min.)	IS:13410-1992	20
26	Izod impact strength (Notched), KJ/m2	IS:13410-1992	55
27	Flexural StrengtH, MPa, Min	IS:13410-1992	170
28	Power Arc Resistance Sec. Min.	IS:13410-1992	180
29	Modulus of Elasticity, 10^3, MPa	IS:13410-1992	12 to 15
30	Tracking Resistance CTI, Min	IS:13410-1992	1000
31	Tensile strength, MPa, Min	IS:13410-1992	70
32	Density of Moulding g/ml	IS:13410-1992	1.8 to 2.1
33	Volume resistivity, ohm-cm, min	IS:13410-1992	1×10^{14}
34	Surface resistivity (24H in water), Ohm, min	IS:13410-1992	1×10^{13}
35	Flow, mm, Min	IS:13411-1992	As per IS
36	Mould shrinkage, linear percent, Max	IS:13411-1992	As per IS
37	Post shrinkage, Max	IS:13411-1992	As per IS
38	Dielectric Strength at 90oC in Oil KV/mm	IS:13410-1992	11
39	Dissipation factor (4 days at 80 % RH & 1 KHz)	IS:13410-1992	0.01
40	Oxygen Index,% Min	IS:13410-1992	24

6.00 TESTING AND MANUFACTURING FACILITIES

6.01 The manufacturer shall have necessary machinery for production of SMC meter box.

6.02 The manufacturer shall have in house testing facilities for carrying out routine and acceptance tests as per IS: 14772 / 2020.

6.03 The bidder shall have the testing facility of flammability test of V0.

7.00 DRAWING /SAMPLE

7.01 The detailed dimensional drawing showing clearly the dimensions and material of meter box and its constructional features shall be invariably furnished with the offer.

7.02 The bidders are required to submit 1 no. of sample of tender item & all necessary accessories along with offer for evaluation. The sample & all necessary accessories as per technical specification shall be submitted free of cost to the E.E.(St.)/Add.E.E.(St.),MSEDCL, Common stores, Airoli before the due date & time of submission of tender. In case the sample is not submitted as required, it will be considered that no offer is made by the tenderer for supply of material. The physical verification of

the sample submitted shall be carried out by E.E., Testing Division, within 10 days from the date of tender opening. Those bidders who failed in sample physical verification, their offer shall be liable for rejection against the tender. The sample of successful bidders shall be retained with MSEDCL. Unsuccessful bidders shall collect the sample within 15 days from the date of finalization of tender at his own cost, failing which the sample shall be treated as MSEDCL's property without any payment and any further notice.

8.00 MARKING / EMBOSSING

The following information shall be clearly and indelibly embossed/ printed on the cover of the meter box.

i) Purchase order number and date
ii) Year and month of manufacture
iii) Name of Purchaser: MSEDCL
iv) Guarantee Period as per tender document
v) Name and trademark of manufacturer
vi) Danger logo (Screen Printed)

9.00 PACKING

9.01 The meter box shall be suitably packed in corrugated boxes in order to avoid damage during transit or handling. The lid of the corrugated boxes may be suitably sealed. The packing cases may be marked to indicate the fragile nature of the contents.

9.02 The following information shall be furnished with the consignment:

- Name of the consignee.
- Details of consignment.
- Destination.
- Total weight of the consignment.
- Sign showing upper / lower side of the crate.
- Sign showing fragility of the material.

10.00 GUARANTEE

The material supplied shall be guaranteed as per tender document.

11.00 SCHEDULES

The tenderer shall fill in the following schedules and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule - 'A' ... Guaranteed Technical particulars (As per GTP

parameters uploaded on e- Tendering site.)

The discrepancies, if any, between the specification and the catalogs and/or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard will not be entertained.

SCHEDULE 'A'

GUARANTEED TECHNICAL PARAMETERS

ITEM NAME	METER BOX MADE OUT OF SHEET MOULDING COMPOUND (SMC), GRADE S3 SUITABLE FOR LT AC SINGLE PHASE 5 – 30 AMPS STATIC ENERGY METER	
SR. NO.	**GUARANTEED TECHNICAL PARAMETERS**	**GTP VALUES**
(1)	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TEXT
(2)	APPLICABLE STANDARDS	TEXT
(3)	METER BOX IS MADE FROM GRADE S3 SMC MATERIAL	BOOLEAN
(4)	METER BOX IS WEATHER PROOF, UNBREAKABLE, SCRATCH RESISTANT HAVING GOOD WORKMANSHIP WITH ROOF TAPERING DOWN ON BOTH SIDES FOR EASY FLOW OF RAINWATER.	BOOLEAN
(5)	METER BOX MATERIAL IS UV STABILIZED TO ENSURE THAT IT DOES NOT GET 'YELLOW' OVER A PERIOD OF TIME.	BOOLEAN
(6)	METER BOX DOES NOT CHANGE IN COLOUR, SHAPE, SIZE, DIMENSIONS WHEN SUBJECTED TO 200 HRS ON UV AGEING TEST AS PER ASTM: G53 (CL. NO. 9.3).	BOOLEAN
(7)	TYPE TEST REPORT IN SUPPORT OF UV AGEING TEST AS PER ASTM: G53 (CL. NO. 9.3) ENCLOSED	BOOLEAN
(8)	METER BOX IS CAPABLE OF WITHSTANDING TEMPERATURE OF BOILING WATER FOR FIVE MINUTES CONTINUOUSLY WITHOUT DISTORTION OR SOFTENING.	BOOLEAN
(9)	TYPE TEST REPORT IN SUPPORT OF ABOVE (8)	TEXT

(10)	THICKNESS OF BASE	TEXT
(11)	THICKNESS OF COVER	TEXT
(12)	METER BOX HAS CLEARANCES AS PER SPECIFICATION	BOOLEAN
(13)	OVERALL DIMENSIONS OF METER BOX LXBXH	TEXT
(14)	BASE AND COVER OF METER BOX ARE INDIVIDUALLY IN ONE PIECE.	BOOLEAN
(15)	COVER IS MADE OVERLAPPING TYPE HAVING COLLARS ON ALL FOUR SIDES.	BOOLEAN
(16)	THE BOX AND COVER SHALL BE FIXED BY CONCEALED STAINLESS STEEL HINGES AND HARDWARE FROM INSIDE IN SUCH A MANNER THAT IT CANT BE MANIPULATED FROM OUTSIDE.	BOOLEAN
(17)	THE DOOR SHALL HAVE LOCKING ARRANGEMENT BY WAY OF DOOR CLOSING U CLAMP OF STAINLESS STEEL MATERIAL.	BOOLEAN
(18)	THE METER BOX BASE AND COVER SHALL HAVE MINIMUM 01 NO WIRE SEALING HOLES FOR SEALING PURPOSE.	BOOLEAN
(19)	COVER IN CLOSED POSITION OVERLAPS BASE SUCH THAT DIRECT ENTRY OF SCREWDRIVER, TOOL OR FILM IS NOT POSSIBLE.	BOOLEAN
(20)	COVER IS PROVIDED WITH SEMI CIRCULAR / CIRCULAR GASKET OF SUFFICIENT SIZE TO COMPLETELY FIT TO GROOVES OF THE BASE.	BOOLEAN
(21)	SEMI CIRCULAR / CIRCULAR GASKET IS MADE OUT OF GOOD QUALITY NEOPRENE RUBBER	BOOLEAN
(22)	COLOUR OF THE METER BOX IS SIEMENS GREY	BOOLEAN

(23)	METER BOX CONFIRMS TO IP-55.	BOOLEAN
(24)	IP-55 TYPE TEST REPORT NO. & DATE	TEXT
(25)	ZINC PASSIVATED SCREWS OF SUFFICIENT SIZES PROVIDED INSIDE METER BOX FOR METERS MOUNTING	BOOLEAN
(26)	4 NOS. OF KEYHOLES OF MINIMUM DIAMETER OF 5 MM PROVIDED AT THE FOUR CORNERS AT THE BACKSIDE OF THE METER BOX TO FACILITATE MOUNTING OF THE METER BOX ON THE WALL OR WOODEN BOARD OR POLE.	BOOLEAN
(27)	2 NOS. OF HOLES WITH POLYMERIC / RUBBER GROMMETS OF MAXIMUM DIAMETER OF 6 OR 8 MM PROVIDED AT THE BOTTOM OF METER BOX FOR INCOMING AND OUTGOING CABLES.	BOOLEAN
(28)	VIEWING WINDOW OF MINIMUM SIZE 140MM X 120MM .TOUGHENED GLASS OF MINIMUM 3 MM THICKNESS	BOOLEAN
(29)	METER BOX TYPE TESTED	BOOLEAN
(30)	TYPE TEST REPORT NO. & DATE	TEXT
(31)	TYPE TEST REPORT ENCLOSED	BOOLEAN
(32)	CONFIRM FLAMMABILITY AS PER UL 94 / IS 11731	TEXT
(33)	CONFIRM SELF EXTINGUISHING AS PER IS 4249.	TEXT
(34)	CONFIRM HEAT DEFLECTION TEMPERATURE @ 1.8 MPA AS PER IS: 13411, ANNEXURE 'H' / ISO 75.	TEXT
(35)	CONFIRM GLOW WIRE TEST AS PER IS: 11000 (PART 2 / SECTION 1) / IEC 695-2-1.	TEXT
(36)	CONFIRM BALL PRESSURE TEST AS PER IS: 14772	TEXT

	/ 2020 OR IEC 335	
(37)	CONFIRM 200 HRS UV AGEING TEST IS CARRIED OUT AS PER ASTM G53 (9.3)	TEXT
(38)	CONFIRM WATER ABSORPTION VALUE AS PER IS: 14772 / 2020	TEXT
(39)	CONFIRM MECHANICAL STRENGTH AS PER IS: 14772 / 2020	TEXT
(40)	CONFIRM FLEXURE STRENGTH.	TEXT
(41)	CONFIRM MODULUS OF ELASTICITY	TEXT
(42)	CONFIRM IZOD IMPACT STRENGTH NOTCHED MINIMUM.	TEXT
(43)	GUARANTEE PERIOD AS PER TENDER DOCUMENT	BOOLEAN
(44)	IN-HOUSE TESTING FACILITY IS AVAILABLE.	BOOLEAN

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

LT AC THREE PHASE 10-60 A or 10-100 A
(WIDE RANGE) AMPS SMART (PREPAID/POSTPAID)
STATIC ENERGY METER AS PER IS: 16444-2015

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1.00 SCOPE

This specification covers the design, engineering, manufacture, assembly, stage testing, inspection and testing before dispatch and delivery at designated stores of ISI marked LT AC 10-60 A or 10-100 A (WIDE RANGE) AMR compatible Smart (Prepaid/Postpaid) Static LCD Three Phase Energy Meter of class 1.0 accuracy with communication module confirming to IS: 16444 / 2015 of the latest version suitable for measurement of Energy (kWh &kVAh) and Demand (kVA MD) in Three phase, Four wire system of LT three phase consumers.

The meter shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 SERVICE CONDITIONS

The meter to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

a)	Maximum ambient temperature	55^0C
b)	Maximum ambient temperature in shade	45^0C
c)	Minimum temperature of air in shade	35^0C
d)	Maximum daily average temperature	40^0C
e)	Maximum yearly weighted average temperature	32^0C
f)	Relative Humidity	10 to 95 %
g)	Maximum Annual rainfall	1450 mm
h)	Maximum wind pressure	150 kg/m^2
i)	Maximum altitude above mean sea level	1000 meter
j)	Isoceraunic level	50 days/year
k)	Seismic level (Horizontal acceleration)	0.3 g

l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

3.00 APPLICABLE STANDARDS

While drawing these specifications, reference has been made to following Indian and International Standard specification. In case certain details are not covered in these specifications, the relevant Indian and International Standard shall be applicable.

IS: 16444 / 2015 of the latest version including CBIP Tech – report - 325 amended up to date, CEA regulations and MERC guidelines with latest amendments.

IS: 15707 / 2006: Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice.

IEC 62052-11 (2003) : Electricity Requirements (AC) General Requirements, Tests and Test conditions for A.C. Static Watt hour meter for active energy Class 1.0 and 2.0.

IEC 62053-21 (2003): A.C. Static Watt hour meter for active energy Class 1.and 2.0.

CEA Regulation on installation and operation of meters dtd: 17/03/2006 with all latest amendments

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standard mentioned above, also shall be considered.

For conflict related with other parts of the specification, the order of priority shall be – (i) this technical specification, (ii) IS: 16444 / 2015 of the latest version.

NOTE: Unless otherwise specified elsewhere in this specification the meters shall confirm to the latest version available of the standard as specified above. If above IS/IEC reports are amended, reference has to be made to Amended IS/IEC/Report up to the date of tenderization.

4.00 ADVANCED METERING INFRASTRUCTURE (AMI)

4.01 AMI functional requirement :

4.01.01 The main objective of AMI is to establish / enable two-way communication between smart energy meter and Head End System (HES) to enable remote reading, monitoring & control of electrical energy meters to serve as repository of all accumulated raw and validated data. The sanitized data may be subscribed by other utility function for higher order analysis and billing and collection engine etc.

4.01.02 The AMI system shall help utility to manage their resource and business process efficiently. AMI system shall support the following minimum functionalities:

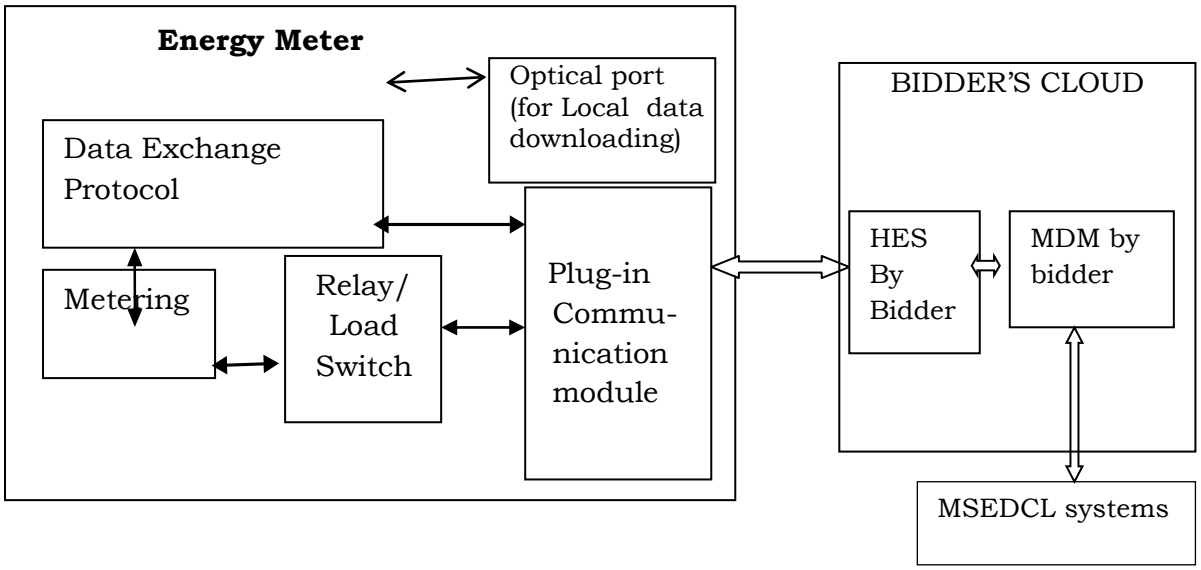
a) Remote Meter data reading (Scheduled/Instantaneous) at configurable intervals (push/pull)
b) Time of Use (TOU) metering;
c) Pre-paid functionality (by default) with provision of post-paid functionality without need for any additional infrastructure;
d) Alarm/Event detection, notification and reporting;

e) Load Limiter and connection/ disconnection at defined/on demand conditions which can be configured remotely in advance;
f) Network Monitoring System for the field area network (NAN/WAN), Remote firmware upgrade, configuration of network nodes and system time synchronization across all devices to ensure accuracy of time stamping;
g) Integration with other existing systems of utility;
h) Security features to prevent unauthorized access to the AMI including Smart Meter & meter data etc.

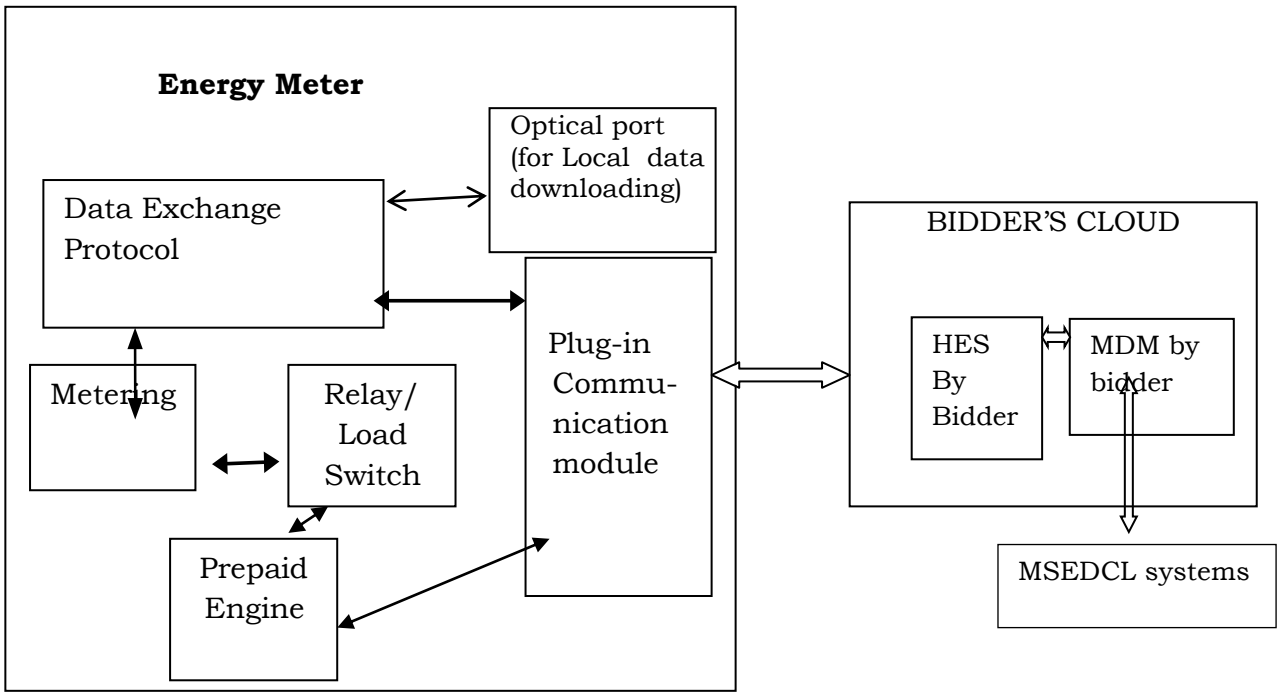
4.01.03 The AMI system shall have following core components of AMI system:

a) Smart Meters;
b) Communication infrastructure;
c) Head End System (HES).
d) Meter Data Management System (MDM);
e) Network Management System (NMS)

Option-I



Option-II



4.02 **Smart Prepaid Meters :**

Smart prepaid meters should comply specifications given in this document.
Metering and metrology requirement shall be according to IS 16444:2015 (A.C. Static direct connected watt-hour smart meters Class 1and 2).

The prepaid functionality can be availed at smart meter level or through MDM.

4.02.01 **Relay/Load Switch:**

The meter shall be provided with switching elements, integral with the meter enclosure, to control the flow of electricity to the load at the instance of connect/disconnect commands as per functional needs of the system.

4.02.02 **Plug-in communication module :**

a. The meter shall be provided with plug-in type communication module (6LoWPAN LPRF or 4G GPRS or NB-IOT or LoRa or PLC) capable of establishing wireless communication with external entities such as Head End System, server etc. Two way communications with external entities should be possible. The selection of communication technology should be as per the site conditions and as per design consideration of bidder to meet the performance as per agreed Service Level Agreements (SLAs).
b. The Smart Meters shall have a dedicated sealable slot for accommodating plug-in type bi-directional communication module which shall integrate the respective communication technology (6LoWPAN LPRF or 4G GPRS or NB-
c. IOT or LoRa or PLC) with the Smart Meters, leading to easy adaptability for network interfaces (WAN/NAN). General requirement for common pluggable communications module for Smart Meters should be as per IS 16444.

d. The Plug-In module should be as per IS 16444. The meter shall log removal of the plug-in type communication module removal event with snapshot.
e. Functionalities of communication module are as below:
    1. Establish wireless communication with external entities such as Head End System, server etc. The communication should be bi-directional i.e. from meter to external entity and from external entity to meter.
    2. Communication module should support both push and pull features.
    3. Communication module should push meter data, events continuously to Head End System (HES) running on bidder's cloud. Default interval for pushing data is 15 minutes and also it should be configurable.
    4. Events should be pushed to Head End System (HES) by communication module immediately after occurrence and restoration.
    5. It is possible to schedule the communication module from Head End System (HES) to pull any data on demand.
    6. Communication module should transfer the connect/disconnect signals received from Head End System (HES) to meter.
f. The selection of communication technology should be as per the site conditions and as per design consideration of bidder to meet the performance as per agreed Service Level Agreements (SLAs).
g. The communication between meter and Head End System (HES) should be secure. It should not be possible to alter the contents during communication.
h. The communication technologies to be implemented should follow relevant national and international standards as applicable. Any suitable standard from International Telecommunication Union (ITU)/ International Electrotechnical Commission (IEC)/ Institute of Electrical and Electronics Engineers (IEEE) /European Standardization Organization (CEN/CENELEC/ETSI) may be considered. Necessary certifications should be provided by bidder for the proposed communication technology, wherever required as per government norms.
i. Cellular technologies if proposed, should be supporting 4G (with facility to fallback on 2G, in case of non-availability of 4G network) or NBIoT or an optical fiber communications network complying to IPv6.
j. Following requirements shall be complied if RF Technology is proposed by bidder for communication module.
    a. RF technology proposed shall be in the frequency bands notified by Government of India.

b. RF technology proposed need to comply with Indian statutory bodies that govern communication related aspects such as WPC (Wireless Planning

c. Co-ordination wing). Equipment Type Approval (ETA) is to be obtained for communication modules as per Department of Telecom, Govt. of India requirements. The bidder shall submit ETA approval issued by WPC along with offer.

d. Radio emission characteristics for the chosen band shall comply with latest NFAP (National Frequency Allocation Plan) and the G.S.R (General Statutory Rules) notifications from Department of Telecom, Government of India.

k. 4G /NBIoT COMMUNICATION MODULE

i. The meter should have 4G/NBIoT communication module. The 4G module should have facility to fall back to 2G networks, where 4G network is not available.

ii. The 4G module should support both Data and SMS transmission. It should have GPRS/EDGE and 4G LTE features.

iii. There should be provision to insert SIM card externally. The SIM slot should have adequate sealing arrangements.

iv. The functionalities of 4G/NBIoT module should be as given in clause No. 4.02.02.e.

l. 6LoWPAN LPRF COMMUNICATION MODULE

1. The meter shall have 6LoWPAN LPRF communication module. The smart meter data using RF mesh shall be collected by Data Concentrator Units (DCUs) and transported to HES through WAN.

2. The 6LoWPAN based Internal Low Power Radio Frequency (LPRF) module shall be based on 6LoWPAN networking on sub-1 GHz (865-867 MHz).

m. Optical port:

n. The meter should have optical port for wired data download locally. The optical port complying with hardware specifications detailed in IEC – 62056 – 21.The baud rate while downloading data through optical port should be 9600. Optionally, it should be possible to download the data through optical port in case of power failure.

4.03 **Communication Infrastructure**

Requirements of communication infrastructure are given in RFP. If RF based solution is proposed, DCU/Gateway/Router/Access points should be installed.

4.04 **HEAD END SYSTEM (HES)**

Bidder has to deploy Head End System (HES) as per details given in RFP.

4.05 **METER DATA MANAGEMENT SYSTEM (MDM)**

Bidder has to deploy Meter Data Management System (MDM) as per details given in RFP. The prepaid functionality can either be availed at smart meter level or through MDM.

5.00 GENERAL TECHNICAL REQUIREMENTS

The equipment shall conform to the following specific parameters.

5.01 The meter to be supplied shall bear ISI mark before commencement of supply.

5.02 Class of Accuracy:

The class of accuracy of the energy meter shall be 1.0. The accuracy shall not drift with time.

5.03 **Current & Voltage Rating:**

The current rating shall be 10 – 60 or 10- 100 Amps. The rated basic current (Ib) shall be 10 Amps.

The maximum continuous current (Imax) shall be 600% of rated basic current i.e. 60 or 100 Amps. Moreover the 10 - 60 Amps or 100 Amps meter shall work accurately upto 120% of Imax.

The Voltage Rating shall be 240 volts. The voltage range shall be (-) 40 % to (+) 20% of rated voltage, i.e. 144 Volts to 288 Volts.

5.04 **Temperature:**

The reference temperature for performance shall be 27^{O} C. The mean temperature co-efficient shall not exceed 0.07%. Temperature rise shall be as per IS: 15884 / 2010 of the latest version.

5.05 **Power Factor:**

Power Factor range: Zero Lag to unity to Zero Lead to unity

Avg. P.F = $\frac{\text{Total(kWh)}}{\text{Total (kVAh)}}$

$$\text{kVAh} = \sqrt{(\text{kWh})^2 + (\text{RkVAhlag} + \text{RkVAhlead})^2}$$

5.06 Power Consumption.

5.06.01 **Voltage Circuit:**

The active & apparent power consumption in voltage circuit including power supply of meter at reference voltage, reference temperature & frequency as per IS 16444 during the idle mode communication module. The additional power requirement during data transmission shall be as per IS 16444 for communication module.

5.06.02 **Current Circuit:**

The apparent power taken by current circuit at maximum current, reference frequency & reference temperature shall not exceed 11.5 VA.

5.07 **Starting Current.**

Meter shall start registering the energy at 0.2 % of basic current (I_b).

5.08 **Frequency.**

The rated frequency shall be 50 Hz with a tolerance of ± 5%.

6.00 CONSTRUCTION

6.01 **GENERAL MECHANICAL REQUIREMENT**

The prepaid meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

a) personal safety against electric shock:

b) personal safety against effects of excessive temperature;

c) protection against spread of fire;

d) protection against penetration of solid objects, dust and water in the meter.

6.02 Meters are required for measurement of Active Energy and shall conform to the latest edition of IS: 16444 / 2015(Alternating Current Static direct connected watt-hour smart meters Class 1and 2 – Specification.

6.03 The meter shall measure the electrical energy consumed.

6.04 All parts, which are subject to corrosion under normal working conditions, shall be protected effectively against corrosion by suitable method to achieve durable results. Any protective coating shall not be

liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions. The electrical connections shall be such as to prevent any opening of the circuit under normal conditions of use as specified in the standard, including any overload conditions specified in the standard. The construction of the meter shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of the wiring, screws, etc. The meter shall not produce appreciable noise in use.

6.05 The meter shall be projection type, dust and moisture proof. The meter base & cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-

breakable qualities. Meter Base shall be opaque and top cover shall be transparent/opaque with transparent window top cover. The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust, moisture & vermin, but without suction in the meter.

6.06 **METERCASE**

The base and cover shall be ultra-sonically welded (continuous welding) or chemically welded so that once the meter is manufactured and tested at factory, it shall not be possible to open the cover at site except the terminal cover and any non-permanent deformation cannot prevent the satisfactory operation of the meter. The components shall be reliably fastened and secured against loosening. The manufacturer shall put at least one seal on meter body before dispatch. The thickness of material for meter body shall be 2 mm minimum. The holding on and sealing screws shall be held captive in the meter cover. The meter shall have a durable and substantially continuous enclosure made wholly of insulating material, including the terminal cover which envelopes all metal parts.

6.07 **TERMINALS & TERMINAL BLOCK**

6.07.01 The terminal block shall be made from high quality non-hygroscopic, fire retardant, reinforced polycarbonate (non-Bakelite) which shall form an extension of the meter case.

6.07.02 The material of which the terminal block is made shall be capable of passing the tests given in IS 1336O (Part 6/Sec 17) for a temperature of 135^0C and a pressure of 1.8 MPa (Method A). The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

6.07.03 The conductors where terminated to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the meter shall screw into a metal nut. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

6.07.04 Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

6.07.05 Two screws shall be provided in each current terminal for effectively clamping the external leads or thimbles. Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall be such as not to pierce and cut the conductors used.

6.07.06 The minimum internal diameter of terminal hole shall be as per IS.

6.07.07 The terminals, the conductor fixing screws or the external or internal conductors shall not be liable to come into contact with terminal covers.

6.07.08 The termination arrangement shall be extended type as per as per clause number 4.2.5 of IS: 15884 / 2010 of the latest version irrespective of rear connections.

6.07.09 The manufacturer shall ensure that the supporting webs between two terminals of the terminal block shall be sufficiently high to ensure that two neighboring terminals do not get bridged by dust and there shall not be any possibility of flash over between adjacent terminals of the terminal block.

6.07.10 The construction of the meter shall be suitable for its purpose in all respects and shall be given reasonable assurance of continuous performance in all mechanical, electrical and magnetic adjustments. The construction shall be such that the meter is not prone to produce audible noise in use. The meter cover & terminal cover shall be of injection molded in transparent UV stabilized polycarbonate in a natural transparent colour.
Polycarbonate material of only following manufacturers or equivalent make shall only be used:

a) GEPLASTICS LEXAN 943A FOR COVER AND TERMINAL COVER LEXAN 503R FORBASE
b) BAYER GRADE CORRESPONDING TOABOVE
c) DOW CHEMICALS ------do --------
d) MITSUBISHI ------do--------
e)TEJIN ------do --------

The meter base shall be manufactured from high quality industrial grade material viz. Polycarbonate with 10 % glass filled which shall meet following properties to ensure higher reliability and long life of the meter case.

6.08 A sticker label or rating plate information shall be laser marked containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than10 in red colour, which

reads as "सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने विज नोंदणी होनार"

6.09 **TERMINAL COVER**

6.09.01 The termination arrangement shall be provided with an extended transparent terminal cover as per clause number4.2.5 of IS: 15884 / 2010 of the latest version irrespective of rear connections.

6.09.02 The terminal cover of a meter shall be sealable independently of the meter cover to prevent unauthorized tampering.

6.09.03 The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

6.09.04 The fixing screws used on the terminal cover for fixing and sealing in terminal cover shall be held captive in the terminal cover.

6.09.05 When the meter is mounted, no access to the terminals shall be possible without breaking seals(s) of the terminal cover.

6.09.06 The terminal cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The terminal cover shall be transparent.

6.10 **RATING OF TERMINALS**

The terminals shall be of suitable rating and shall be capable of carrying 120% of Imax and made of electro-plated (or tinned) brass or NI plated brass and shall be of fixed type.

6.11 The provision shall be made on the meter for at least two seals to be put by utility user.

6.12 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non-ageing and of tested quality.

6.13 A capacitive touch button shall be provided for high resolution reading of display with three decimal digits as brought out elsewhere

in this specification (optional) or meter should have facility to display high resolution energy values in Wh with resolution of 7 digits before decimal and 1 digits after decimal.

6.14 **RESISTANCE TO HEAT AND FIRE**

The terminal block, the terminal cover, the insulating material retaining the main contacts in position and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

The material of the terminal block shall not deflect under heating. To comply therewith, they must fulfill the tests as specified in 5.2.4 of IS: 15884 / 2010 of the latest version.

A capacitive touch button shall be provided for scrolling the parameters in Alternate Display (On Demand) mode as well as forced it

in emergency credit units in the meter as brought out elsewhere in the specification.

6.15 **REAL TIME INTERNAL CLOCK(RTC)**

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 seconds per year. The calendar and the clock shall be correctly set to Indian Standard Time. The RTC shall have long life (minimum10 Years) with Non rechargeable battery.

6.16 Meter memory shall have the following details.

- Transaction history data with date &time
- All the events history with time based and category based information,
- Monthly history and consumption data of the energy consumed for the last 12months,
- All the limiting parameters shall also be available in meter reading.

6.17 **RETENTION TIME OF THE NON-VOLATILEMEMORY**

For long outages, the payment meter shall be designed such that any data necessary for correct operation shall be retained for a minimum period of 10 years without an electrical supply being applied to the meter.

6.18 **OUTPUT DEVICE**

6.18.01 The meter shall have a test output device preferably with flashing red LED/LCD accessible from front and capable of being monitored with suitable testing equipment.

6.18.02 Output devices generally may not produce homogeneous pulse sequences. Therefore, the manufacturer shall state the necessary number of pulses to ensure that measurement uncertainty factor due to repeatability of meter is less than 1/10 of the error limits specified at different test points and consistent with desired resolution.

6.18.03 The resolution of the test output in the form of pulses of high resolution register, whether accessible on the meter through external display, shall be sufficient to conduct satisfactorily accuracy test at lowest test point defined in particular requirements in less than 5 min and starting current test in less than 10 min.

6.19 The meter shall be capable to withstand phase to phase voltage (440V) if applied between phase to neutral continuously.

6.20 Power supply unit in the meter shall be transformer less to avoid magnetic influence.

6.21 Meter shall be tamper proof. No tampering shall be possible through Optical port.

6.22 Display parameters in the meter shall not be accessible for reprogramming at site through any kind of communication.

6.23 The measurement by meter shall not get influenced by injection of High frequency AC Voltage / chopped signal / DC signal and harmonics on the terminals of the meter. In case, meter functionality get affected it will log the event and perform measurement as per prevailing electrical conditions.

6.24 The meter shall record and display total energy including Harmonic energy.

6.25 The meter shall be provided with LED/LCD indicators for communication in progress. Two separate LED/LCD indicators should be provided for data transmission (TxD) mode and data receiving (RxD)mode.

6.26 **SELF DIAGNOSTIC FEATURES**

6.30.01 The meter shall be capable of performing complete self- diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.

6.30.02 The meter shall display unsatisfactory functioning / non-functioning / malfunctioning of Real Time Clock, battery.

6.30.03 All display segments: "LCD Test" display shall be provided for this purpose.

6.27 **WIRE / CABLE LESS DESIGN**

The meter shall be wireless to avoid improper soldering & loose connection / contact.

6.28 The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 mentioned in table 20 for EMI/EMC of IS 13779:1999 amended up to date. The meter shall remain immune for any higher signals than the present standards and MSEDCL technical specifications as indicated above.

6.29 The communication of energy meters shall not be affected considering the above feature state in the clause 6.28

6.30 The watch dog provided shall invariably protect the hanging of microprocessor during such type of tampering devices.

6.31 The fully tested double layered glass epoxy shall be used. The latest technology such as hybrid microcircuit or application specific integrating circuit (ASIC) shall be used to ensure reliable performance.

The mounting of components on the PCB shall be SMT(Surface Mounted Technology) Type. The electronic components used in the meter shall be of high quality from world renowned manufacturers and there shall be no drift in accuracy of the meter for at least up to 5 ½ years.

The meter PCB shall be wireless to avoid improper soldering & loose connection / contact. The PCB material shall be Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm. It should be framed by A class vendor.

6.32 PCB used in meter shall be made by Surface Mounting Technology.

6.33 The meter shall be capable of being read through communication module and optical port.

6.34 **LATCHING RELAY (LOADSWITCH)**

6.34.01 Meter shall have three latching relays, one for each phase to disconnect the full load.

6.34.02 The latching relay shall be bi-stable type latching switch designed and manufactured in accordance with international standard of IEC and DIN EN 61810 part 1 / VDE 0435 part 201 as well as they shall meet

the overload and short circuit requirement of IEC, DIN EN 61036 /61037 & ANSI C12. The Latching relay shall confirm to the load switching capabilities as per relevant IS. The latching relay shall be with trip-free design as given in IS

6.34.03 Precautionary measures shall be taken to protect the latching relay from adverse effects resulting from the ingress or vermin into the payment meter.

6.34.04 The latching relay shall be designed and rated to make and break at Vref, Imax with a linear resistive load and at Vref, Ib, 0.4 inductive power factor for 3,000operations.

6.34.05 Latching relay should connect and disconnect supply according to signal received from remote server having prepaid engine.

6.34a.06 Once the load is interrupted by disconnect command from prepaid engine, the latching relay shall only be operable to restore the load after a further appropriate connect command received from prepaid engine or through OPTICAL port.

6.35 The meter shall be able to disconnect the load at overload i.e. 105% and tripping should be done immediately. Also, for testing purpose meter shall be able to work accurately upto 120% of Imax.

7.00 **Metering Protocol:**

As per IS: 15959 / 2011 (Part-I) and IS: 15959/2016 (Part-II) with latest amendments.

8.00 **TOD TIMING**

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable. At present the time zones shall be programmed as below.

Zone A (TZ1): 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs
Zone B (TZ2): 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs
Zone C (TZ3): 09=00 Hrs. to 12=00Hrs.
Zone D (TZ4): 18=00 Hrs. to 22=00Hrs.

9.00 **MAXIMUM DEMAND INTEGRETION PERIOD**

The maximum demand integration period shall be set at 30 minute Block window method.

10.0 **MD RESET**

It shall be possible to reset MD by the following options:

Auto reset at 24:00 hrs at the end of each billing cycle: Automatic

reset at the end of certain predefined period (say, end of the month). This option shall be programmable through prepaid server for the actual date required. No push button shall be provided for MD reset.

13.00 PREPAID AND CONNECT/DISCONNECTFEATURES

13.01 Disconnection Mechanism:

Meter should support disconnection under following conditions:

a. Over current
b. Load Control Limit (Programmable and set by MSEDCL)
c. Pre-programmed event conditions
d. Disconnection signal from Prepaid Engine (Remote disconnection on demand) or from optical port.
e. In case of balance of consumer reduced to zero

13.02 Reconnection Mechanism:

Meter should support reconnection under following conditions:

a. Local reconnection due to disconnection under over current & load control limit.
b. Remote reconnection, after receipt of command from prepaid engine, when consumer recharges account.
c. Reconnection after receipt of command through optical port.

14.00 TAMPER & FRAUD MONITORING FEATURES:

14.01 ANTI TAMPER FEATURES

The meter shall detect and correctly register energy only in forward direction under following tamper conditions:

(i) Change of phase sequence: The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(ii) Reversal of line and load terminals: Even on interchanging the load and line wires, the meter shall register correct energy passing through the meter.

(iii) Drawing of current through local Earth: the meter shall register accurate energy even if load is drawn partially or fully through a local earth.

(iv) The three-phase meter shall continue to work even without neutral at any load condition.

(v) The three-phase meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(vi) The meter shall work without earth.

(vii) The potential link shall not be provided.

(viii) Visual indication shall be provided to safeguard against wrong connections to the meter terminals.

(ix) The meter shall be immune to the external magnetic field as per CBIP325. If the accuracy of the meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering the maximum value current (Imax) at ref. voltage and unity PF in all the three phases.

(x) The meter shall be immune to abnormal voltage / frequency generating devices.

(xi) The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 mentioned in table 20 for EMI/EMC of IS 13779:1999 amended up to date.

14.02 **TAMPER EVENTS**

The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS.

The no. of times the tampering has been done shall also be registered in the meter.

Minimum 280 numbers of events (occurrences & restoration with date

& time) shall be available in the meter memory. The recording of abnormal events shall be on FIFO basis.

All the information of data shall be made available in simple & easy to understand format.

The meter shall have features to detect the occurrence and restoration of the following abnormal events:

(a) Missing potential and potential imbalance

The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of potential failure and low potential, which could happen due to disconnection of potential leads (one or two). Meter shall also detect and log cases of voltage unbalance (10% or more for 5 Minutes.) Higher of the 3 phase voltages shall be considered as reference for this purpose.

(b) Current unbalance

The meter shall be capable of detecting and recording occurrence and restoration with date and time of current unbalance (30% or more for 15 minutes).

Higher of the 3 phase currents shall be considered as reference for this purpose.

(c) Current Reversal

The meter shall be capable of detecting and recording occurrence and restoration with date and time of reversal of current with phase identification for persistence time of 5minutes.

(d) Current circuit short

The meter shall be capable of detecting and recording occurrences and restoration of shorting of any one or two phases of current, with date & time of occurrence and restoration.

(e) High Neutral Current (CT bypass)

The meter shall be capable of recording incidences of excess neutral current (if it is in excess 10% of Ib for more than 5 minutes.).

The meter shall record the total duration of the above abnormalities, time and date of their occurrences and restorations with snapshot of instantaneous electrical conditions viz. System Voltages, Phase Currents & System PF.

(f) Power ON /OFF

The meter shall be capable to record power ON/OFF events in the meter memory. All potential failure shall record as power off event.

(g) Meter Cover Open

In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper

event with date & time stamping and the meter shall continuously display that the cover has been tampered. It is suggested that the manufacturer shall develop their software such that there will be some time delay for activation of this tamper feature and during that period only the meter cover shall be fitted. The delay in activation of software shall be for one instance only. After the meter cover is fitted, it shall get activated immediately without any delay.

(h) Tamper indications to be displayed on LCD display to be defined by suppliers.

(i) The threshold values for various tamper are as below.

Sr. No.	Description	Occurrence (With Occ. Time 5 min.)	Restoration (With Rest. Time 5 min.)
1.	PT link Missing (Missing potential)	< 50% of Vref	> 50% of Vref
2.	Over voltage in any phase	> 115 % of Vref	< 115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance (Diff. of phase voltages)	> 10 % Vref	< 10 % Vref
5.	CT reverse	Change in direction of current	Current flow in forward direction
6.	CT Open	Zero Amps in one or two phases and current in at least 1 phase is >5% Ib for 15 minutes	>3 % Ib for 15 min in the tampered phase for 15 min
7.	Current Unbalance (Diff. of phase currents)	> 30 % Ib for 15 min	< 30 % Ib for 15 min

8.	Current Bypass	Bypass Current >10 % Ib for 15 min	Bypass Current <10%Ib for 15 min
9.	Over Current in any Phase	> 105 % Imax	< 105 % Imax
10.	Influence of permanent magnet or AC /DC electromagnet / permanent magnet	Immediate	1 minute after removal
11.	Neutral Disturbance	--	--
12.	Power failure	Immediate	
13.	Very Low PF	--	--
14.	Meter Cover Opening	2 to 4 mm	--

For above abnormal conditions, the recording of events shall be on FIFO basis.

Event data should be immediately pushed by the meter to Head End System (HES) on occurrences and restorations of events. Also it shall be possible to retrieve the abnormal event data along with all related snap shots data through optical port and upload the same to Head End System (HES).

15.00 DISPLAY OF MEASURED VALUES

15.01 The display shall be permanently backlit LCD, visible from the front of the meter. The display shall be electronic and when the meter is not energized, the electronic display need not be visible.

15.02 **MINIMUM CHARACTERSIZE:**

The energy display shall be minimum 5 digits. The height of the display characters for the principal parameters values shall not be less than 3.4 mm. The size of digit shall be minimum 8.5 x 3.4 mm and legible enough to view from distance.

15.03 The principal unit for the measured values shall be the kilowatt hour (kWh & kVAh) and the maximum demand in kVA (kVA MD) along with the time.

15.04 The decimal units shall not be displayed for cumulative kWh & kVAh in auto scroll mode. However it shall be displayed in capacitive touch button mode for high resolution display for testing.

15.05 The meter shall be pre-programmed for following details.

Voltage: 240V

Integration period for kVA MD shall be of 30 minutes real time based.

The meter shall auto reset kVA maximum demand (KVA MD) at 2400 Hrs. of last day of each calendar month and this value shall be stored in the memory along with the cumulative kWh & kVAh reading. No reset push button shall be provided.

The Default Display (Auto scrolling mode) shall switch to Alternate Display (On Demand Display Mode) after pressing the capacitive touch button continuously for 5 seconds.

The Alternate Display (On Demand Display Mode) shall switch over to Default Display if the capacitive touch button is not operated for 15 seconds.

15.06 The meter shall have facilities to measure, record and display the parameters as per IS: 16444 / 2015 of the latest version.

Where multiple values are presented by a single display, all relevant values shall be available via appropriate selection (choice of selection shall be general, for example capacitive touch button).

15.07 The register shall be able to record and display starting from zero, for a minimum of 1500 h, the energy corresponding to maximum current at reference voltage and unity power factor. The register shall not rollover during this duration.

15.08 DISPLAY INDICATORS:

The following shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the prepaid meter.

a. Supply indication.

b. Relay status.

c. Meter cover forcibly open tamper event

The meter shall be provided with LED/LCD to indicate communication in progress. Two separate LED/LCD indicators should be provided for data transmission (TxD) mode and data receiving (RxD) mode or have two separate LCD indication for WAN and HAN is accepted. Optionally, indicators for mode of data transmission (TxD, RxD) shall be available on communication module.

15.09 The display parameters shall be pre-programmed at factory.

15.10 **MINIMUM DISPLAY CAPABILITY (MEASURING PARAMETERS):**

(A) DEFAULT DISPLAY (AUTO SCROLL MODE):

The following parameters shall be capable of being displayed on the Smart (Prepaid) metering default display (auto scroll mode).

(a)	Active Energy Cumulative kWh

The following parameters shall be capable of being displayed by Smart (Prepaid) meter in alternate display by capacitive touch button

(B)	On – Demand Display (Alternate Display)
1.	Meter Sr. No.
2.	Last date & time of MD - kVA reset
3.	Current – I_R
4.	Current – I_Y
5.	Current – I_B
6.	Voltage – V_R
7.	Voltage – V_Y
8.	Voltage – V_B
9.	Signed Power Factor – R Phase
10.	Signed Power Factor – Y Phase
11.	Signed Power Factor – B Phase
12.	Frequency
13.	High resolution kWh (for calibration)
14.	High resolution kVArh Lag(for calibration)
15.	High resolution kVArh Lead(for calibration)
16.	High resolution kVAh (for calibration)
17.	Last Tamper Event with date and time.

16.00 BILLING DATA, BILLING HISTORY, LOAD SURVEY & TAMPER DATA

16.01 BILLING DATA

The billing data is summarized as below.

Sr. No.	Parameters
1.0	Billing Date
2.0	System Power Factor for billing period
3.0	Cumulative Energy – kWh
4.0	Cumulative Energy – kWh for TZ1
5.0	Cumulative Energy – kWh for TZ2
6.0	Cumulative Energy – kWh for TZ3
7.0	Cumulative Energy – kWh for TZ4
8.0	Cumulative Energy – kVAh
9.0	Cumulative Energy – kVAh for TZ1
10.0	Cumulative Energy – kVAh for TZ2
11.0	Cumulative Energy – kVAh for TZ3
12.0	Cumulative Energy – kVAh for TZ4
13.0	Maximum demand (kVA MD) with date & time.
14.0	Maximum demand (kVA MD) with date & time for TZ1.
15.0	Maximum demand (kVA MD) with date & time for TZ2.
16.0	Maximum demand (kVA MD) with date & time for TZ3.
17.0	Maximum demand (kVA MD) with date & time for TZ4.
18.0	Billing power ON duration in Minutes (During billing period)

16.02 **BILLING HISTORY:**

The meter shall have sufficient non-volatile memory for recording history of billing parameters (as per above table) for last 12 months.

16.03 **INSTANTANEOUS PARAMETERS:**

Instantaneous parameters are summarized as below.

Sr. No.	Parameters
1.0	Real Time Clock- Date & Time
2.0	Current, I_R
3.0	Current, I_Y
4.0	Current, I_B
5.0	Voltage, V_{RN}
6.0	Voltage, V_{YN}
7.0	Voltage, V_{BN}
8.0	Three Phase Power Factor, PF
9.0	Number of Power Failures
10.0	Cumulative Power OFF Duration in Minutes
11.0	Cumulative Tamper Count
12.0	Cumulative billing count
13.0	Cumulative Energy – kWh
14.0	Cumulative Energy-kVAh
15.0	Maximum demand (kVAMD)
18.0	Relay (Load Switch) Status

For parameter No. 16& 18 the value will be 1 if relay (load switch) is connected and 0 if disconnected

16.04 **LOAD SURVEY PARAMETERS:**

The array of data to be retained inside the meter memory shall be for the 60(Power On) days for a capture period of 30 minutes. 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.

(1)	Real Time Clock – Date and Time
(2)	Current – I_R
(3)	Current – I_Y
(4)	Current – I_B
(5)	Voltage – V_{RN}
(6)	Voltage – V_{YN}
(7)	Voltage – V_{BN}
(8)	Block Energy – kWh
(9)	Block Energy – kVArh – lag
(10)	Block Energy – kVArh – lead
(11)	Block Energy – kVAh

16.05 TAMPER DATA:

Event data (as per clause No. 14) should be immediately pushed by the meter to prepaid server on occurrences and restorations of events. Also it shall be possible to retrieve the abnormal event data along with all related snap shots data through OPTICAL port and upload the same to Head End System (HES).

17.00 DEMONSTRATION

The purchaser reserves the right to ask for the demonstration of the equipment offered at the purchaser's place.

18.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the above diagram. The diagram & terminal marking on sticker will not be allowed.

20.00 MARKING OF METER

20.01 NAME PLATE

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standard. The manufacturer's meter constant shall be marked on the Name Plate.

In addition to the requirement as per IS, following shall be marked on the Name Plate.

Purchase Order No.
Month and Year of manufacture
Name of purchaser i.e. MSEDCL
Guarantee Period as per tender document
ISI mark
Communication Technology with Carrier frequency

The meter Serial No. shall be Bar Coded along with Numeric No. The size of Bar Code shall not be less than 35x5 mm. Stickers for meter serial no., in any case will not be accepted.

A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than10 in red colour, which reads as "सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने विज नोंदणी होनार" .

21.00 TESTS

21.01 TYPE TESTS

The prepaid meter to be supplied shall be fully type tested for the properties / requirement as per IS: 16444/2015, IS 15884 / 2010 and all relevant IS and IEC of the latest version and external AC / DC magnetic influence tests as per CBIP Tech–Report 325 with latest amendments. Type test certificate shall be submitted along with offer and the same shall not be more than 5 years old at the time of commencement of supply. The Type Test Reports shall clearly indicate the constructional features of the type tested meter.

The Type Test Certificate as per IS: 16444 / 2015 (For the purpose of IS 16444/2015 all definitions given in IS 16444 shall apply) shall be submitted along with the offer. Separate Type Test Reports for each type of meter to be supplied shall be submitted. All the Type Tests shall have been carried out from Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, Bangalore / Bhopal, ERDA Vadodara, ERTL to prove that the meter to be supplied meets the requirements of the specification. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable. Type Test for prepaid features as per IS shall be confirmed for the parameters indicated elsewhere in the specification also at manufacturers' lab during inspection.

All The type test reports including additional acceptance tests of meter to be supplied shall be got approved from Chief Engineer, Testing & Quality Control before commencement of supply.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost.

21.02 Meters to be supplied shall pass all the acceptance and routine test as laid down in IS: 15884 / 2010 of the latest version and also additional acceptance tests as prescribed in this specification. (3 to 8 meter from a lot more than 1,000 shall be sealed randomly in the factory and will be tested for tamper events.)

21.03 **ADDITIONAL ACCEPTANCE TESTS:**

The following additional tests on meter to be supplied shall be carried out in addition to the acceptance tests specified in IS: 15884 / 2010 of the latest version.

(a) **ACCEPTANCE TEST FOR PREPAID FEATURES:**

i) Test of credit balance &debit.

ii) Test of friendly credit hours, Start & end time thereof

iii) Test of disconnect the output supply when credit reach to zero.

iv) Test of reconnect the output supply on providing credit limit.

v) Test of disconnect output supply if load / current exceeded the preset value in the meter.

vi) Test of reconnect output supply if load / current falls below the preset value in the meter.

vii) Test of application of tariff.

(b) **OTHER ACCEPTANCE TESTS:**

i) Glow wire testing for polycarbonate material.

ii) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440V between phase and neutral without damage/problems,

iii) Tamper conditions as stated in this specification,

iv) Power consumption tests,

v) The meter shall comply all the tests for external AC / DC magnetic field as per CBIP Tech Report 325 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. If the accuracy of the meter gets affected during the test, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor. After removal of magnet, meter shall be subjected to accuracy test as per IS: 15884 /
2010 of the latest version. No deviation in error is allowed in the accuracy as per specifications.

vi) The meter shall withstand impulse voltage at 6kV.

vii) The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 for EMI/EMC of IS 13779:1999 amended up to date. For any higher signals than the present standards and MSEDCL technical specifications indicated above.

The test as per clause no. 26.03 (c) (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre-dispatch inspection.

The tests as per clause no. 26.03 (c) (v) ,(vi)& (vii) shall be carried out on one sample from first lot as per procedure laid down in IS: 15884 / 2010 of the latest version and CBIP Tech. Report – 325 in NABL LAB. The test report shall be got approved from Chief Engineer, Testing & Control Cell before commencement of supply.

21.04 LIMITS OF ERROR:

Limits of variation in percentage error due to change in voltage shall not exceed the values given in the following table

Sr. No.	Influence quantities	current Value	Power factor	Limits of variation in % error for class 1 meters
a)	Voltage variation – 15% to +10%	I_b I_b	1 0.5 lag	0.7 1.0
b)	Voltage variation – 40% & +20%	I_b I_b	1 0.5 lag	1.1 1.5

(i) The meter shall be tested at (-) 15% and at (-) 40% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.

(ii) For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS: 15884 / 2010 of the latest version.

22.00 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall also furnish the particulars giving specific required details of Meter in schedule `A' attached. The offers without the details in Schedule 'A' stands rejected.

23.00 TENDER SAMPLE

Tenderer are required to submit sample meters as mentioned in tender document as per IS: 16444 / 2015 (amended upto date) with communication module as per technical specification with valid type test certificates as per IS: 16444 / 2015 (amended upto date), CBIP tech report 325 (amended upto date) from any of the NABL accredited Lab & valid BIS certificate, connecting telephonic cable with connectors fixed to cable, API / Exe file with documentation, documentation, Exe / API for validating downloaded meter data, etc. of each offered type / item along with their offer to EE (SM) in the office of the Chief Engineer, MSEDCL, Material Management Cell, 1st Floor, Prakashgad, Bandra (E), Mumbai – 400051 on or before the time & date stipulated for submission of offer for testing the sample meters in third party NABL Lab like CPRI, ERDA, ERTL, etc. and testing the offered API with BCS and vending software & documentation etc. by our IT Department as per technical specifications for testing of data downloading and prepaid features etc. The type tests carried out as per IS: 16444 / 2015(amended update) during last five years from the date of opening of the tender shall be

valid. The offer of those eligible bidders shall only be considered if the meter sample passes the tests at NABL Lab & MSEDCL IT Section. The results of NABL Lab & MSEDCL IT Section shall not be disputed and shall be binding on the bidder.

The required information such as Manufacturer's Name or Trade Name, Sr. No., ISI Certification No. etc. shall be on stickers to be affixed on outer portion of sample meters being submitted along with the offer. Such information shall not be embossed or printed on any part of the sample meter.

Out of these, two samples shall be without Ultrasonic welding to confirm constructional features.

24.00 PRE DESPATCH INSPECTIONS

All acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The Company's representative / Engineers attending the above testing shall carry out testing on suitable number of meters as per sampling procedure laid down in IS: 15884 / 2010 of the latest version and additional acceptance test as per this specification and issue a test certificate approval to the manufacturer and give clearance for dispatch. All the meters offered for inspection shall be in sealed condition. The seals of sample meter taken for testing & inspection shall be break open & resealed after inspection. The routine tests of latching relay shall also be carried out & confirmed. The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer, Inspection Wing.

25.00 INSPECTION AFTER RECEIPT AT STORES (RANDOM SAMPLE TESTING)

For carrying out "Random Sample Testing (RST), the sample meter will be drawn from any one of the stores against inspected lot and same shall be tested at respective Testing and Quality Assurance units at Aurangabad, Bhandup, Kolhapur, Nagpur, Nashik & Pune. Sample meter shall be drawn as per Appendix "H" of IS: 13779 / 1999 (amended up to date). Sample meter will be tested by MSEDCL Testing

Engineer in presence of supplier's representative jointly for (i) starting current, (ii) Limits of error, (iii) Repeatability of error, (iv) No Load Test as per IS: 15884 / 2010 of the latest version(v) Test for prepaid feature as per clause no. 26.03 (a). The RST shall be carried out by the Testing Division allotted by Chief Engineer, MM Dept.

The 5 days advance intimation shall be given to the supplier and if the supplier fails to attend the joint inspection on the date informed, the testing will be carried out by our testing engineer in absence of supplier's representative. If the meter fails in above random sample testing, the lot will be rejected.

26.00 TRAINING

The bidder / manufacturer shall arrange various training programmes for administration training, user training and trouble shoot training free of cost with supported documents like system software manual, system operation manual. Training shall be imparted to at least 100 officers for user training and at least 5 officers for administration training.

27.00 GUARANTEE

The prepaid meters with communication module and allied software / hardware shall be guaranteed as per tender document.

28.00 PACKING

28.01 The prepaid meter with communication module, CMRI etc. shall be suitably packed in order to avoid damage during transit or handling. Each meter and CMRI may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit.

The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning.

The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

28.02 The following information shall be furnished with the consignment:

(i) Name of the consignee

(ii) Details of consignment

(iii) Destination

(iv) Total weight of the consignment

(v) Sign showing upper / lower side of the crate

(vi) Sign showing fragility of the material

(vii) Handling and unpacking instructions

(viii) Bill of Material indicating contents of each package and spare material.

29.00 QUALITY CONTROL

29.01 The purchaser has a right to send a team of experienced engineers for assessing the capability of the firm for manufacturing and testing of meters as per this specification.

The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

29.02 Meters supplied shall give service for a long period without drifting from original calibration & performance must be near to zero percent failure.

30.00 MINIMUM TESTING FACILITIES

30.01 Manufacturer shall posses fully computerized automatic Meter Test Bench System having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly for carrying out routine and acceptance Tests as per IS: 15884 / 2010 of the latest version. Test Reports for each and every meter shall be generated. The list of testing equipments shall be enclosed.

30.02 The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests:

a) Insulation resistance measurement

b) No load condition

c) Starting current

d) Accuracy requirement

e) Power consumption

f) Repeatability of error

g) Transportation test – as per clause no. 26.03(b)

h) Tamper conditions - as per clause no.15.00

i) Prepaid Feature Testing Facility as per clause no. 26.03 (a) &IS.

j) The manufacturer shall have duly calibrated RSS meter of class 0.1 or better accuracy.

k) The manufacturer shall have Glow Wire Testing facility

30.03 METER SOFTWARE

The Bidders will have to get appraised & obtain Capability Maturity Model Integration CMMI – Level III as on the date of tender.

31.00 MANUFACTURING ACTIVITIES

The manufacturer shall submit the list of plant and machinery along with the offer.

A. Meter shall be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process. The loops/wired joints must be avoided on PCB. Further, the Bidder shall own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities.

B. Quality shall be ensured at the following stages:

a) At PCB manufacturing stage, each Board shall be subjected to computerized bare board testing.

b) At insertion stage, all components shall undergo computerized testing for conforming to design parameter and orientation

c) Complete assembled and soldered PCB shall undergo functional testing using Automatic Test Equipments(ATEs).

d) Important:

Prior to final testing and calibration, all meters shall be subjected to ageing test (i.e. Meters will be kept in heating chamber for 72 hours at 55^{O} C temperature at full load current. After 72 hours, meter shall work satisfactory) to eliminate infant mortality.

C. The calibration of meter shall be done in-house on a computerized testing bench having stabilized power supply.

D. The bidders shall submit the list of all (imported as well as indigenous) components to be used in meter, separately along with the offer. List of makes of components is attached herewith as a guide line (Annexure -II).

E. Bought out items:

A detailed list of bought out items which are used in the manufacturing of the meter, shall be furnished indicating the name

of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

F. List of Plant and Machinery used for Energy meter Production.

Sr. No.	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meter	Routine Testing and Calibration of Meter
2	Semiautomatic Bench with MSVT testing	Routine Testing and Calibration of Meter
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meter class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meter
9	Automatic Pick And Place Machines	Automatic placing ofSMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools

15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meter
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meter
30	Short term over Current testing setup	Type testing of Meter

31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meter
33	Composite Environmental testing chambers	Type testing of Meter

32.00 QUALITY ASSURANCE PLAN

32.01 The tenderer shall invariably furnish QAP as specified in Annexure - I along with his offer the QAP adopted by him in the process of manufacturing.

32.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

33.00 COMPONENT SPECIFICATION

As per Annexure - II enclosed.

34.00 SCHEDULES

The tenderer shall fill in the following schedules and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule `A' .... Guaranteed Technical particulars (As per parameters uploaded on e - Tendering site.)

The discrepancies if any between the specification and the catalogs and/or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

If it is observed that there are deviations in the offer in Guaranteed Technical Particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

ANNEXURE - I

Quality Assurance Plan

A. The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i. Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates :

ii. Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii. List of manufacturing facilities available.

iv. Level of automation achieved and list of areas where manual processing exists.

v. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi. List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

B. The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i. List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished alongwith offers.

ii. Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii. Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C. The contractor shall operate systems which implement the following:

i. Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's

written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

ii. Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

D. The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i. The structure of the organization.

The duties and responsibilities assigned to staff ensuring quality of work.

The system for purchasing taking delivery and verification of material.

The system for ensuring quality workmanship.

The system for retention of records.

The arrangement for contractor’s internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii. Quality Plans:

An outline of the proposed work and programme sequence.

The structure of the contractor's organization for the contract.

The duties and responsibilities assigned to staff ensuring quality of work.

Hold and notification points.

Submission of engineering documents required by the specification.

The inspection of materials and components on receipt.

Reference to the contractor's work procedures appropriate to each activity.

Inspection during fabrication / construction.

Final inspection and test.

ANNEXURE - II

Component Specification

The make/grade and the range of the components should be from the following list or any reputed/equivalent make.

Sr. No	Component function	Requirement	Makes and Origin
1	**Current Transformers**	If the Meter is with one current transformers as measuring elements. The current transformer should withstand for the clauses under 5&9 of IS-13779 /1999	ANY MAKE OR ORIGIN CONFORMING TO IS-2705 OR RELEVANT STANDARD.
2	**Measurement**	The measurement or computing chips used in the Meter should be with the Surface mount type along with the ASICs	USA: Anolog Devices, Cyrus Logic, Atmel, Philips South Africa :SAMES Japan : NEC
3	**Shunt Bimetal**	E-beam welded shunts shall be provided in the phase element and CT/ Shunt / Hall effect sensor may be provided in the neutral. Alternatively, both the current elements (phase & neutral) shall have E-beam welded shunts with proper isolation	Redbourn Engg /Isabelle/
4	**Quartz Crystal**		AVX, VANLONG, ADVANCED CRYSTAL etc
5	**Memory chips**	The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Philips, ST, Japan :

			Hitachi
6	**Display modules**	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2meters. c) The construction of the modules should be such that the displayed quantityshould not disturbed with the life of display(PIN Type). d) It should be trans- reflective HTN or STN type industrial grade with extended temperature range.	Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics/ Bona-fide/ Jebon VIZ. Hongkong: Genda Singapore: Bonafied Technologies. Korea: AdvantekChina : Success Japan : Hitachi, Sony. TIANMA,Haijing, Holtek,
7	**Communication Modules**	Communication modules should be compatible for the optical port for communication with meter reading instruments	USA: National , Semiconductors HP, Optonica. Holland/ Korea : Phillips Japan : Hitachi Taiwan:Ligitek
8	**Optical port**	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily. The Optical Port should not be adversely affected by influence of electro magnetic field, Static discharge..	USA: National Semiconductors HP Agilent Holland/Korea : Phillips Japan: Hitachi Taiwan: Ligitek
9	**Power supply**	The power supply should	SMPS Type or

		Be with the Capabilities as per the relevant standards. It should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	better
10	**Electronic components**	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Philips, Taxas Instruments, Siemens WELWYN, VISHAY DRALORIC,YAGEO ,KOA, R OHM,PHYCOMP,F AIRC HI LD,PHILIPS,VISHA Y SEMICOND, TEXAS INSTRUMENT,EPC OS, OSRAM,INFINION, NATI O NAL SEMICONDetc. Japan : Toshiba , Hitachi, Oki, AVZ or Ricon Korea; Samsung
11	**Mechanical parts**	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	

12	**Battery**	Chargeable/ Non chargeable maintenance free guaranteed life of 10 years.	Varta, Tedirun, Sanyo or National, Panasonic, Renata
13	**RTC & Micro controller.**	The accuracy of RTC shall be as per relevant IEC/ IS standards.	USA: Philips, Dallas, ST, Xicor Atmel, Motorola, Microchip Japan : NEC or Oki.
14	**PCB**	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6mm.	A class vendor

SCHEDULE 'A'

GUARANTEED TECHNICAL PARAMETERS

ITEM NAME	LT AC THREE PHASE, 10 -60 or 10-100 AMPS PREPAID STATIC ENERGY METER AS PER IS: 16444 - 2015 WITH COMMUNICATION MODULE FOR COMMUNICATION FOR USE ON LT CONSUMER INSTALLATIONS	
SR. NO.	GUARANTTED TECHNICAL PARAMETERS	GTP VALUES
1.0	MAKE & TYPE	TEXT
2.0	APPLICABLE STANDARD	TEXT
3.0	ACCURACY CLASS 1.00 (YES/NO)	BOOLEAN
4.0	METER BEARS ISI MARK (YES/NO)	BOOLEAN
5.0	RATED VOLTAGE 240 V (YES/NO)	BOOLEAN
6.0	VOLTAGERANGE (-) 40% TO (+) 20% OF RATED VOLTAGE(YES/NO)	BOOLEAN
7.0	FREQUENCY 50 HZ +/- 5% (YES/NO)	BOOLEAN
8.0	RATED BASIC CURRENT 10 AMPS (YES/NO)	BOOLEAN
9.0	MAXIMUM CONTINUOUS CURRENT IMAX 60/100 AMP (YES/NO)	BOOLEAN
10.0	METER WORKS ACCURATELY UPTO 120% OF IMAX, (YES/NO)	BOOLEAN
11.0	STARTING CURRENT 0.2 % OF IB. (YES/NO)	BOOLEAN
12.0	POWER CONSUMPTION IN VOLTAGE CIRCUIT AS PER IS16444 (YES/NO)	BOOLEAN
13.0	POWER CONSUMPTION IN CURRENT CIRCUIT AS PER IS16444 (YES/NO)	BOOLEAN
14.0	POWER FACTOR ZERO TO UNITY (ALL LAG OR LEAD) (YES/NO)	BOOLEAN

15.0	STANDARD REFERENCE TEMPERATURE FOR PERFORMANCE IS 27^{O}C(YES/NO)	BOOLEAN
16.0	MEAN TEMPERATURE CO-EFFICIENT DOES NOT EXCEED 0.07%(YES/NO)	BOOLEAN
17.0	TEMPERATURE RISE IS AS PER IS: 15884 / 2010 OF THE LATEST VERSION. (YES/NO)	BOOLEAN
18.0	OPAQUE METER BASE & COVER MADE OF UNBREAKABLE, TOUGH, HIGH GRADE, FIRE RESISTANT TRANSPARENT/OPAQUE POLYCARBONATE MATERIAL (YES/NO)	BOOLEAN
19.0	METER BODY TYPE TESTED FOR IP 51 DEGREE OF PROTECTION AS PER IS 12063 (YES/NO)	BOOLEAN
20.0	FURNISH PHYSICAL WATER ABSORPTION VALUE	TEXT
21.0	FURNISH THERMAL HDDT VALUE	TEXT
22.0	FLAMMABILITY V2 (YES/NO)	BOOLEAN
23.0	FURNISH FLAMMABILITY VALUE	TEXT
24.0	GLOW WIRE TEST AT 650° C	TEXT
25.0	TENSILE STRENGTH	TEXT
26.0	FLEXURE STRENGTH	TEXT
27.0	MODULUS OF ELASTICITY	TEXT
28.0	IZOD IMPACT STRENGTH NOTCHED 23° C	TEXT
29.0	FURNISH PHYSICAL WATER ABSORPTION VALUE	TEXT
30.0	TERMINAL BLOCK IS MADE FROM HIGH QUALITY NON-HYGROSCOPIC, FIRE RETARDANT, REINFORCED POLYCARBONATE (NON-BAKELITE) (YES/NO)	BOOLEAN
31.0	MATERIAL OF WHICH TERMINAL BLOCK IS MADE IS CAPABLE OF PASSING TESTS GIVEN IN IS: 1336O (PART 6/SEC 17) FOR A TEMPERATURE OF 135^{0} C AND A PRESSURE OF 1.8 MPA (METHOD A)(YES/NO).	BOOLEAN

32.0	EXTENDED TRANSPARENT TERMINAL COVER IS AS PER CLAUSE NUMBER 4.2.5 OF IS: 15884 / 2010 OF THE LATEST VERSION (YES/NO)	BOOLEAN
33.0	TRANSPARENT TERMINAL COVER IS SEALABLE INDEPENDENTLY(YES/NO)	BOOLEAN
34.0	PROPER SIZES OF GROOVES ARE PROVIDED AT BOTTOM OF TERMINAL COVER (YES/NO)	BOOLEAN
35.0	METER BASE & COVER ARE ULTRA-SONICALLY WELDED (CONTINUOUS WELDING) OR CHEMICALLY WELDED (YES/NO)	BOOLEAN
36.0	THICKNESS OF MATERIAL FOR METER 2 MM MINIMUM WITH POSITIVE TOLERANCE (YES/NO)	BOOLEAN
37.0	SCREWS USED ON TERMINAL COVER FOR FIXING & SEALING IN TERMINAL COVER ARE HELD CAPTIVE IN TERMINAL COVER (YES/NO)	BOOLEAN
38.0	TERMINALS ARE OF SUITABLE RATING & ARE CAPABLE OF CARRYING 120% OF IMAX & MADE OF ELECTRO-PLATED (OR TINNED) BRASS & ARE OF REPLACEABLE TYPE (YES/NO).	BOOLEAN
39.0	TERMINAL BLOCK, TERMINAL COVER, INSULATING MATERIAL RETAINING MAIN CONTACTS IN POSITION & METER CASE ENSURE REASONABLE SAFETY AGAINST SPREAD OF FIRE. THEY DO NOT IGNITE BY THERMAL OVERLOAD OF LIVE PARTS IN CONTACT WITH THEM (YES/NO).	BOOLEAN
40.0	MATERIAL OF TERMINAL BLOCK DOES NOT DEFLECT UNDER HEATING &. TO COMPLY THEREWITH, FULFILLS TESTS SPECIFIED IN 5.2.4 OF IS: 15884 / 2010 OF THE LATEST VERSION (YES/NO).	BOOLEAN
41.0	RTC PRE-PROGRAMMED FOR 30 YEARS DAY / DATE (YES/NO)	BOOLEAN
42.0	MAXIMUM DRIFT OF RTC	TEXT
43.0	RTC HAS LONG LIFE OF 10 YEARS (YES/NO)	BOOLEAN

44.0	PROVISION TO PUT AT LEAST TWO SEALS ON METER (YES/NO)	BOOLEAN
45.0	METER MEMORY HAS DETAILS AS PER CLAUSE NO. 6.16. (YES/NO)	BOOLEAN
46.0	NON-VOLATILE MEMORY IS FOR A MINIMUM PERIOD OF 10 YEARS (YES/NO)	BOOLEAN
47.0	OPERATION INDICATOR PROVIDED IN THE FORM OF BLINKING LED / LCD (YES/NO)	BOOLEAN
48.0	RESOLUTION OF TEST OUTPUTIS SUFFICIENT TO CONDUCT SATISFACTORILY ACCURACY TEST AT LOWEST TESTPOINTIN LESS THAN 5 MIN & STARTING CURRENT TEST IN LESS THAN 10 MIN. (YES/NO)	BOOLEAN
49.0	METER CONSTANT INDELIBLY PROVIDED ON NAME PLATE (YES/NO)	BOOLEAN
50.0	CAPACITIVE TOUCH BUTTONS ARRANGEMENT FOR HIGH RESOLUTION READING & SCROLLING THE PARAMETERS IN ALTERNATE DISPLAY (ON DEMAND) MODE	TEXT
51.0	METER ACCURACY DOES NOT GET AFFECTED BY MAGNETIC FIELD FROM ALL SIDES OF METER (YES/NO)	BOOLEAN
53.0	METER CAPABLE TO WITHSTAND PHASE TO PHASE VOLTAGE (440 V) IF APPLIED BETWEEN PHASE TO NEUTRAL FOR CONTINUOUSLY (YES/NO)	BOOLEAN
54.0	POWER SUPPLY UNIT IS TRANSFORMER LESS (YES/NO)	BOOLEAN
56.0	METER IS TAMPER PROOF & NO TAMPERING IS POSSIBLE THROUGH OPTICAL PORT(YES/NO).	BOOLEAN
57.0	DISPLAY PARAMETERS IN METER ARE NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION (YES/NO).	BOOLEAN

58.0	COMPLETE METERING SYSTEM & MEASUREMENT NOT AFFECTED BY EXTERNAL ELECTROMAGNETIC INTERFERENCE AS PER CL. NO. 6.25 OF TECH. SPECS.(YES/NO)	BOOLEAN
59.0	METER MEETS REQUIREMENT OF CBIP TECH. REPORT 325 (YES/NO)	BOOLEAN
61.0	METER RECORDS AND DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY(YES/NO).	BOOLEAN
62.0	METER PCB IS WIRELESS(YES/NO)	BOOLEAN
63.0	METER MANUFACTURED USING SMT (YES/NO)	BOOLEAN
64.0	METER IS CAPABLE OF BEING READ THROUGH PULG-IN COMMUNICATION MODULE AND OPTICAL PORT (YES/NO).	BOOLEAN
65.0	COMMUNICATION MODULE USED IN METER	TEXT
66.0	COMMUNICATION TECHNOLOGY ANF COMMUNICATION PROTOCOL USED TO TRANSFER DATA FROM METER TOSERVER	TEXT
67.0	CARRIER FREQUENCY USEDFOR DATA COMMUNICATION	TEXT
68.0	BI-STABLE TYPE & MANUFACTURED IN ACCORDANCE WITH INTERNATIONAL STANDARD OF IEC & DIN EN 61810 PART 1 / VDE 0435 PART 201, TWO LATCHING RELAYS FOR PHASE & NEUTRAL ARE PROVIDED (YES/NO).	BOOLEAN
69.0	LATCHING RELAYS MEET OVERLOAD & SHORT CIRCUIT REQUIREMENT OF IEC, DIN EN 61036 / 61037 & ANSI C12 AND CONFIRM TO LOAD SWITCHING CAPABILITIES AS PER RELEVANT IS (YES/NO)	BOOLEAN
70.0	LATCHING RELAYS ARE WITH TRIP-FREE DESIGN AS PER IS (YES/NO).	BOOLEAN

71.0	LATCHING RELAYS ARE DESIGNED & RATED TO MAKE & BREAK AT VREF, IMAX WITH A LINEAR RESISTIVE LOAD AND AT VREF, IB, 0.4 INDUCTIVE POWER FACTOR FOR 3,000 OPERATIONS(YES/NO).	BOOLEAN
72.0	AS THE BALANCE CREDIT DECREASES BEYOND PRE-DEFINED LEVEL, LATCHING RELAYS DISCONNECT SUPPLY TO LOAD (YES/NO).	BOOLEAN
73.0	METER DISCONNECTS LOAD IN CASE OF EXCEEDING CURRENT LIMIT (120% IMAX) AFTER IMMEDIATELY ON STABILIZING THE CURRENT (YES/NO).	BOOLEAN
74.0	COMMUNICATION CAPABILITY OF METER IS BASED ON COMMUNICATION MODULE AND HARDWARE PORT COMPATIBLE WITH OPTICAL PORT SPECIFICATIONS (YES/NO).	BOOLEAN
75.0	COMMUNICATION MODULE IN METER IS ABLE TO TRANSFER DATA TO PREPAID ENGINE AND RECEIVE COMMANDS FROM PREPAID ENGINE (YES/NO)	BOOLEAN
76.0	METER HAS WIRED COMMUNICATION WITH OPTICAL PORT FOR DOWNLOADING ALL TYPES OF DATA FROM THE METER (YES/NO).	BOOLEAN
77.0	METER IS NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION FOR ANY ALTERATION IN THE FACTORY SETTINGS (YES/NO).	BOOLEAN
78.0	OPTICAL PORT PROVIDED FOR DATA DOWNLOADING (YES/NO)	BOOLEAN
79.0	SEALING ARRANGEMENT FOR COMMUNICATION MODULE IS PROVIDED(YES/NO)	BOOLEAN
80.0	OPTICAL PORT SUPPORT DEFAULT & MINIMUM BAUD RATE OF 9600 BPS (YES/NO)	BOOLEAN
81.0	TOD TIME ZONES PROVIDED (YES/NO)	BOOLEAN
82.0	PROVISION TO SET MAXIMUM DEMAND INTEGRATION PERIOD AT 30 MINUTE AS PER REQUIREMENT (YES/NO).	BOOLEAN

83.0	AUTO RESET AT 24:00 HRS AT THE END OF EACH BILLING CYCLE OR AT THE END OF CERTAIN PREDEFINED PERIOD (SAY, END OF THE MONTH) IS PROVIDED (YES/NO)	BOOLEAN
84.0	AN LED/LCD FOR POWER ON INDICATION IS PROVIDED (YES/NO).	BOOLEAN
85.0	LED/LCD PROVIDED FOR POWER ON INDICATION BLINKS DURING COMMUNICATION (YES/NO).	BOOLEAN
86.0	DEBIT LIMIT UPTO FIVE DIGITS INR IS PROVIDED INTO PREPAID ENGINE(YES/NO)	BOOLEAN
87.0	METER IS CAPABLE TO UPDATE CREDIT BALANCE AND BALANCE UNITS VIA HEAD END SYSTEM AND OPTICAL PORT (YES/NO)	BOOLEAN
88.0	METER DATA MANAGEMENT SYSTEM (MDM) IS ABLE TO CONFIGUREAMOUNT FOR ENERGY CHARGES, FIXEDCHARGES, TAXES ETC. AS PER TARIFF APPLICABLE(YES/NO)	BOOLEAN
89.0	METER DISCONNECTS OUTPUT SUPPLY WHEN CREDIT REACHES TO ZERO EXCEPT EMERGENCY CREDIT LIMIT(YES/NO)	BOOLEAN
90.0	PREPAID ENGINE IS CAPABLE TO CONFIGURE FOREMERGENCY CREDIT LIMIT BEFORE DISCONNECTIONOF OUTPUT SUPPLY AFTER END OF HAPPY HOURS(YES/NO)	BOOLEAN
91.0	PREPAID ENGINE IS ABLE TO EXPORT THE BILLINGDATA AS PER MSEDCL FORMAT GIVEN IN CLAUSE NO.11.10 (YES/NO)	BOOLEAN
92.0	ALL ANTI-TAMPER FEATURES AS PER CLAUSE 14.00 ARE PROVIDED (YES/NO)	BOOLEAN
93.0	PERMANENT BACKLIT LCD TYPE DISPLAY IS PROVIDED(YES/NO)	BOOLEAN
94.0	5 NUMBER OF DIGITS FOR ENERGY DISPLAY PROVIDED(YES/NO)	BOOLEAN
95.0	MINIMUM SIZE OF DIGITS (8.5 x 3.4 MM) (YES/NO)	BOOLEAN

96.0	METER PRE-PROGRAMMED FOR (a) 240 V (YES/NO)	BOOLEAN
97.0	(b)INTEGRATION PERIOD OF 30 MIN FOR MD (YES/NO)	BOOLEAN
98.0	(c) AUTO RESET KWMD AT 2400 HRS. OF LAST DAY OF EACH CALENDAR MONTH(YES/NO)	BOOLEAN
99.0	(d) NO RESET PUSH BUTTON PROVIDED FOR MD RESET (YES/NO)	BOOLEAN
100.0	DISPLAY INDICATORS BY LED / LCD PROVIDED AS PER CLAUSE NO. 15.10 (YES/NO)	BOOLEAN
101.0	PARAMETERS IN AUTO SCROLL MODE DISPLAYED FOR MINIMUM 10 SECONDS INCLUDING LCD CHECK (YES/NO).	BOOLEAN
102.0	DEFAULT DISPLAY SWITCHES TO ALTERNATE DISPLAY AFTER PRESSING THE CAPACITIVE TOUCH BUTTON CONTINUOUSLY FOR 5 SECONDS(YES/NO)	BOOLEAN
103.0	ALTERNATE DISPLAY SWITCHES TO DEFAULT DISPLAY IF CAPACITIVE TOUCH BUTTON IS NOT OPERATED FOR 15 SECONDS(YES/NO)	BOOLEAN
104.0	KVA MD PROVIDED (YES/NO)	BOOLEAN
105.0	METER HAS NON-VOLATILE MEMORY FOR RECORDING HISTORY OF BILLING PARAMETERS FOR LAST 12 MONTHS (YES/NO).	BOOLEAN
106.0	PROVISION FOR LOAD SURVEY FOR 30 MINUTES & FOR LAST 60 POWER ON DAYS FOR SPECIFIED PARAMETERSON FIFO (YES/NO)	BOOLEAN
107.0	METER RECORDS TAMPER EVENTS AS SPECIFIED IN SPECIFICATION (YES/NO).	BOOLEAN
108.0	METER KEEPS RECORDS FOR MINIMUM 100 EVENTS. (OCCURRENCE + RESTORATION) FOR ABNORMAL CONDITIONS ON FIFO BASIS (YES/NO).	BOOLEAN

109.0	IT IS POSSIBLE TO RETRIEVE ABNORMAL EVENT DATA ALONG WITH ALL RELATED SNAP SHOTS DATA THROUGH OPTICAL PORT AND UPLOAD THE SAME TO HEAD END SYSTEM (HES) (YES/NO)	BOOLEAN
110.0	METERING PROTOCOL TO BE IMPLEMENTED BY THE BIDDER	TEXT
111.0	PREPAID ENGINE IS ABLE TO SEND CONNECT/DISCONNECT SIGNAL TO COMMUNICATION MODULE IN METER ACCORDING TO BALANCE OF CONSUMER(YES/NO)	BOOLEAN
112.0	PERMANENT NATURE CONNECTION DIAGRAM OF METER IS SHOWN ON INSIDE PORTION OF TERMINAL COVER (YES/NO)	BOOLEAN
113.0	CLEARLY VISIBLE, EFFECTIVELY SECURED, INDELIBLY & DISTINCTLY MARKED NAME PLATE WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARD & SPECIFICATION IS PROVIDED (YES/NO)	BOOLEAN
114.0	METER IS TYPE TESTED (YES/NO)	BOOLEAN
115.0	TYPE TEST REPORT NUMBER & DATE OF METER	TEXT
116.0	GUARANTEE PERIOD AS PER TENDER DOCUMENT (YES/NO)	BOOLEAN
117.0	SAMPLE METERS AS PER TENDER DOCUMENT WITH COMMUNICATION MODULE FOR CONNECTIVITY AS PER TECHNICAL SPECIFICATION ALONG WITH CONNECTING TELEPHONIC CABLE WITH CONNECTORS FIXED TO CABLE, API / EXE FILE WITH DOCUMENTATION, BCS AND VENDING STATION SOFTWARE ETC IS SUBMITTED ALONGWITH OFFER (YES/NO).	BOOLEAN

118.0	IN HOUSE TESTING FACILITIES ARE AVAILABLE FOR (a) INSULATION RESISTANCE MEASUREMENT (YES/NO)	BOOLEAN
119.0	(b) NO LOAD CONDITION (YES/NO)	BOOLEAN
120.0	(c) STARTING CURRENT TEST (YES/NO)	BOOLEAN
121.0	(d) ACCURACY TEST REQUIREMENT (YES/NO)	BOOLEAN
122.0	(e) POWER CONSUMPTION (YES/NO)	BOOLEAN
123.0	(f) TRANSPORTATION TEST(YES/NO)	BOOLEAN
124.0	(g) FULLY COMPUTERISED METER TEST BENCH SYSTEM FOR CARRYING OUT ROUTINE AND ACCEPTANCE TEST IS AVAILABLE (YES/NO)	BOOLEAN
125.0	(h)MANUFACTURER HAS CALIBRATED STANDARD METER OF 0.1 CLASS ACCURACY(YES/NO)	BOOLEAN
126.0	(i)VERIFIACTION OF DATA DOWNLOADING WITH COMMUNICATION MODULE(YES/NO)	BOOLEAN
127.0	(j) GLOW WIRE TESTING (YES/NO)	BOOLEAN
128.0	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE (YES/NO)	TEXT
129.0	MANUFACTURING ACTIVITIES ARE AS PER CLAUSE 37.00 (YES/NO)	BOOLEAN
130.0	QAP SUBMITTED AS PER ANNEXURE-I (YES/NO)	BOOLEAN
131.0	AGEING TEST IS CARRIED OUT ON METER (YES/NO)	BOOLEAN
132.0	WHETHER YOU AGREE TO SUPPLY METERS AS PER ANEXURE-D, I.E. TECHNICAL SPECIFICATIONS OF THE TENDER. (YES/NO)	BOOLEAN

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

THREE PHASE METER BOX FOR THREE PHASE 10-60 OR WIDE RANGE AMPS SMART METER

1.0 SCOPE:

This specification covers design, manufacturing, testing at works and supply of Three Phase Meter Box. The Meter Box shall be made out of Sheet Moulding Compound (SMC) confirming to IS: 13410 / 1992 amended upto date & IS: 14772 /2020 (amended upto date) for use in electrical distribution system in Maharashtra. The system shall be AC three phase, four wires, 415 V, 50 Hz with effectively grounded neutral. The Meter Box shall be suitable for housing Three Phase Four Wire Static TOD Tri - Vector Energy Meters in indoor as well as outdoor applications.

2.0 SERVICE CONDITION:

The Meter Box to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions.

Max. & ambient air temperature	50 degree C
Max. relative humidity	100%
Max. annual rainfall	1450 mm
Max. wind pressure	150 Kg/Sq.m
Max. altitude above mean sea level	1000 mtrs
Seismic level (Horizontal acceleration)	0.3 g
Isoceraunic level	50 days/year
Climatic condition	Moderately hot and humid Tropical climate conducive to rust and fungus growth
Ambient temperature for temperature rise	50 deg.C

3.0 APPLICABLE STANDARDS:

Unless otherwise modified in this specification, the meter box shall generally confirm with the provisions of IS: 14772 / 2020 (Amended up to date) and material of construction i.e. for SMC to IS: 13410 / 1992 to IS: 13947 & requirement of this specification.

4.0 DESIGN & CONSTRUCTION:

4.1 The Meter Box shall be made from Thermosetting Plastic i.e. glass reinforced polyester sheet moulding compound (SMC) confirming to IS: 13410/ 1992, & requirement of this specification.

4.2 Meter Box shall comprise of a moulded base and moulded door

manufactured with SMC. The manufacturing process of Box shall be Hot Press Compression Moulding Process for (SMC).

4.3 The base and cover of meter box shall be individually in one piece except for fixing of accessories like hinges, clamp, handles etc.

4.4 The meter box shall be so constructed as to have roof tapering down for easy flow of rainwater.

4.5 SMC material is used for Meter Box shall be moulded using 100% virgin SMC, grade S-3 material. The box shall be weather proof, unbreakable and scratch resistant & shall have good workmanship. For SMC, the wall thickness of the meter box base shall be minimum 3 mm on load bearing side and 2 mm on all other sides, thickness of cover shall be minimum 2 mm.

4.6 The Colour of the SMC Meter box shall be Siemens Grey.

4.7 The SMC meter box shall be made of anti-corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant high grade SMC material having good dielectric and mechanical strength property.

4.8 The surface appearance or part of meter box must be smooth, non porous and homogeneous, free from ripples, defects and marks. No fillers or fibres shall be visible at any place.

4.9 The meter box shall have base raised by about 20 mm in the box for easy wiring for fixing the meter. The meter screws shall not protrude outside.

4.10 The Meter Box shall facilitate wireless data communication with minimal disruption for AMR purpose.

4.11 The internal dimensions of three phase meter box shall be such that there should be minimum 60 mm clearance at the bottom, 40 mm clearance on all three sides, 25 mm clearance at the front and 10 mm clearance at the back between meter and meter box inner wall

4.12 The boxes shall be suitable for outdoor application.

4.13 Corners of the Meter Box shall be round and not pointed ones.

4.14 Doors with locking arrangement shall be provided. Provision of wire seal should be made for 2 seals.

4.15 Hinges, locking arrangement shall be of stainless steel only.

4.16 For SMC, the base and cover must be UV stabilized to ensure that it does not get 'Yellow' over a period of time. It shall not change in colour, shape, size, dimensions when subjected to 200 hrs on UV ageing test as per ASTM: G53 (Cl. No. 9.3), 4 Hours UV at 600 C and 4 Hours Condensation at 500 C. The base and cover shall be capable of withstanding temperature of boiling water for five minutes continuously without distortion or softening.

4.17 The Box and Cover should be fixed by concealed stainless steel hinges and hardware from inside in such a manner that it can't be manipulated from outside. The door shall having locking arrangement by way of min. 2 nos. door closing 'U' Clamp of stainless steel material.

4.18 The door of Box shall open 90 deg. Collar of each door (cover) in closed position shall rest on the collar of the body (base) of Box. The collar of the door shall overlap the collar of the body of Box by 8 mm such that direct entry of screwdriver, tool or film is not possible. The cover shall be provided with rubber gasket of suitable size to completely fit to the base. The gasket shall be made out of good quality neoprene rubber. Thickness of rubber lining shall be such that it provides proper sealing between the cover & base of Box to avoid penetration of dust & ingress of water.

4.19 The enclosure shall comply with the requirements of IP – 55

4.20 For meter reading, the box shall have window with Toughened Glass of 5 mm thickness fixed with stainless steel frame from inside. Glass shall have scratch proof "MSEDCL" logo on the right side top comer of the glass. This glass shall be fixed from inside of the cover of Meter Box, with single piece stainless steel frame (Glass Holder). The glass has to be fitted with a wrap around single piece rubber ring without joint made from good quality neoprene rubber so that it can withstand weather effect. The box shall have windows of size 140 x 120 mm.

4.21 The mounting arrangement of the meter shall be on particle board/ adjustable bracket to facilitate meter fiixing. The thickness of particle board shall be min. 10 mm.

4.22 For mounting the box on pole/wall, four strips shall be welded / fixed on the box. Strips shall be 25 mm wide & 3 mm thick of M.S. sheet.

4.23 For cable entry and exit holes of suitable dia with polymeric/rubber grommets shall be provided as shown in drawing.

4.24 Earthing Bolts of size 25 x 6 mm fitted with the box from inside, shall be provided for external earthing with 2 plain washers, one spring washer & two nuts. Earthing bolt shall have no layer of powder coating and shall be property zinc plated.

4.25 The tolerance permissible on the various dimensions shall be 3%. (Negative tolerance is not accepted)

5.0 TESTS & TEST CERTIFICATES:

The meter box shall be fully type tested in accordance with the relevant standards and as per MSEDCL requirement. All the Type Tests specified in the technical specifications shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CIPET, EQDC, ERDA, ERTL, CPRI, etc. to prove that equipments meet the requirement of the specification.

The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per respective IS. Type Tests of SMC meter box as per IS: 14772/2020 (amended up to date) and IS: 13410 / 1992 (amended up to date) shall submit along with offer and got approved from CE (Testing & QC) MSEDCL before commencement of supply.

The tenderer shall also furnish certificate from laboratories where type tested that required test facility available in-house for that particular test. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The Box shall be fully type tested as per IS: 14772/2020 (amended up to date) and IS: 13410 / 1992 (amended up to date) and as per requirement of this specification. The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per respective IS and other type tests as well as acceptance tests as per table below.

All the Type Tests shall be carried out from Laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, Bangalore /Bhopal, ERDA Baroda, ERTL, EQDC, CIPET to prove that the box meets the requirements of specification. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The type test report of meter box having identical constructional and other features carried out during last five years prior to due date of opening of

offer shall be valid.

The detailed type test reports shall be furnished with relevant oscillogram and certified drawings of the equipment tests. The offers without type test reports shall be rejected.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. All the type test reports shall be got approved from the Chief Engineer (Testing & Quality Control), MSEDCL, 5th Floor, Prakashgad, Bandra (E), Mumbai – 400 051 as per tender conditions.

The type test reports of SMC Meter Box as given below shall be furnished with certified drawings to prove that equipment offered meets the requirement of the specification.

Sr. No.	Test	Reference Standard	Required Value
1	Ratings	IS-14772:2020, Cl. 6	As per IS and specification
2	Classification	IS-14772:2020, Cl. 7	As per IS
3	Marking	IS-14772:2020, Cl. 8	Manufacturer Name & Danger Logo Screen Printing
4	Dimensions	IS-14772:2020, Cl. 9	As per specification and drawing
5	Protection against Electric Shock	IS-14772:2020, Cl. 10	As per IS
6	Provision for Earthing	IS-14772:2020, Cl. 11	As per IS
7	Construction	IS-14772:2020, Cl. 12	No Crack or Damage
8	Resistance to ageing, protection against ingress of solid objects and against harmfull ingress of water	IS-14772:2020, Cl. 13	No Crack or Damage
9	Insulation resistance and electric strength	IS-14772:2020, Cl. 14	Insulation resistance shall be not less than 5 MΩ. No flashover or breakdown shall occur during the electrical strength test
10	Mechanical Strength	IS-14772:2020, Cl. 15	No Crack or Damage
11	Resistance to Heat	IS-14772:2020, Cl. 16	No ball impression
12	Creepage distance, clearance and distance through seating compound	IS-14772:2020, Cl. 17	As per IS
13	Resistance to insulating material to abnormal heat and fire	IS-14772:2020, Cl. 17	No Flame and Glowing

14	Resistance to Tracking	IS-14772:2020, Cl. 19	No failure or breakdown occurs before 50 Drops 175V
15	Resistance to corrosion	IS 14772:2020, Cl. 20	No sign of rust observed
16	Heat Deflection Temperature	IS 13411:1992	> 150 deg C
17	Exposure to Flame	IS 4249:1967	Self Extinguishing
18	Flammability	UL-94/IS-11731	V0
19	Melting Point	IS:13360 (Part-6/Sec-10):1992	Does not melt upto 400 deg C
20	Glow wire test at 960 Deg C	IS:11000	No flame and glowing observed
21	Ball Pressure Test	IEC-335	No Ball Impression Observed
22	UV Ageing Test for 200 Hours	ASTM-G-154	No Colour Change, no chalking and No discoloration observed
23	Water Absorption	IS:13411-1992	< 0.20%
24	Material Identification	As per Laboratory Method	Glass reinforced polyester Sheet Moulding compound (SMC)
25	Glass content, percent by mass (Min.)	IS:13410-1992	20
26	Izod impact strength (Notched), KJ/m2	IS:13410-1992	55
27	Flexural Strength ,MPa , Min	IS:13410-1992	170
28	Power Arc Resistance Sec. Min.	IS:13410-1992	180
29	Modulus of Elasticity, 103 , MPa	IS:13410-1992	12 to 15
30	Tracking Resistance CTI, Min	IS:13410-1992	1000
31	Tensile strength, MPa, Min	IS:13410-1992	70
32	Density of moulding, g/ml	IS:13410-1992	1.8 to 2.1
33	Volume resistivity, ohmcm, min	IS:13410-1992	1×10^{14}
34	Surface resistivity (24H in water), Ohm, min	IS:13410-1992	1×10^{13}
35	Flow, mm, Min	IS:13411-1992	As per IS
36	Mould shrinkage, linear percent, Max	IS:13411-1992	As per IS
37	Post shrinkage, Max	IS:13411-1992	As per IS
38	Dielectric Strength at 90oC in Oil KV/mm	IS:13410-1992	11
39	Dissipation factor (4 days at 80 % RH & 1 KHz)	IS:13410-1992	0.01
40	Oxygen Index,% Min	IS:13410-1992	24

Acceptance Tests in line IS: 14772:2020 and IS:13410-1992 for Sheet Moulding Compound (SMC) Enclosure for conformance to the values specified therein

Sr. No.	Test	Reference Standard
1	Marking	IS 14772:2020
2	Dimensions	IS 14772:2020
3	Protection against Electric Shock	IS 14772:2020
4	Provision for Earthing	IS 14772:2020
5	Construction	IS 14772:2020
6	Resistance to Ageing, to humid condition, to ingress of solid objects and to harmful ingress of water	IS 14772:2020
7	Mechanical Strength	IS 14772:2020
8	Density of Moulding, g/ml(*1.8 to 2.1)*	IS:13410-1992
9	Surface Resistivity (24 hrs in water), Ohm	IS:13410-1992
10	Volume Resistivity, Ohm-cm	IS:13410-1992
11	Impact Strength, KJ/m2	IS:13410-1992
12	Tensile Strength, MPa	IS:13410-1992
13	Power Arc Resistance, sec	IS:13410-1992
14	Heat Distortion Temperature, Deg. C	IS:13410-1992

6.0 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of Meter box in schedule 'A' attached (As per Guaranteed Technical Particulars uploaded on e - Tendering site). The offers without the details in Schedule 'A' stand rejected.

7.0 TESTING & MANUFACTURING FACILITIES:

The Tenderer must clearly indicate the details of testing facilities available in the works of manufacturer and whether the facilities are adequate to carry out all the Routine and Acceptance tests. These facilities shall be available to MSEDCL Engineers, if deputed to carry out or witness the tests in the manufacturer's works. The tenderer must have all in-house testing

facility to carry out acceptance & routine tests on the meter box as per relevant IS. If any test cannot be carried out in the manufacturer works, the same shall be clearly stated. All testing equipments shall be duly calibrated in the NABL approved laboratories. The Bidder shall have the testing facility of flammability test of V0 for SMC Meter Box.

8.0 MANUFACTURING FACILITIES:

If SMC Meter Box is offered, the tenderer shall have the following minimum manufacturing facilities in house to prove his reliability as a manufacturer of Energy Metering Box.

(a) SMC material manufacturing machine
(b) Hydraulic press for hot press compression moulding
(c) Assembly lines for fabrication and fitting

9.0 GURANTEE:

The meter box shall be guaranteed as per tender document

10.0 MARKINGS:

The meter box shall have an indelibly and distinctly marked with all essential particulars as per relevant standards. In addition to the requirement as per relevant standard, following information shall clearly & indelibly be embossed/printed on the cover of the meter box.

a) Purchase order number and date
b) Year and month of manufacture
c) Name of Purchaser: MSEDCL
d) Guarantee Period as per tender document
e) Name and trademark of manufacturer
f) Danger logo (Screen Printed)

11.0 PACKING:

The meter box shall be suitably packed in corrugated boxes in order to avoid damage during transit or handling.

12.0 SCHEDULES:

The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule 'A' – Guaranteed Technical Particulars

The discrepancies, if any, between the specification and the catalogues and/or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard will not be entertained.

13.0 DRAWINGS/SAMPLE

The successful bidder shall submit set of all above drawings of the distribution box and its components shall be submitted in triplicate to CE (T-QC) office and get approved before commencement of supply.

The bidders are required to submit 1 (One) no. of sample of tender item & all necessary accessories along with offer for evaluation. The sample & all necessary accessories as per technical specification shall be submitted free of cost to the E.E.(Stores)/Add.E.E.(Stores),MSEDCL, Common stores, Airoli before the due date & time of submission of tender. In case the sample is not submitted as required, it will be considered that no offer is made by the tenderer for supply of material. The physical verification of the sample submitted shall be carried out by E.E., Testing Division, within 10 days from the date of tender opening. Those bidders who failed in sample physical verification, their offer shall be liable for rejection against the tender. The sample of successful bidders shall be retained with MSEDCL. Unsuccessful bidders shall collect the sample within 15 days from the date of finalization of tender at his own cost, failing which the sample shall be treated as MSEDCL's property without any payment and any further notice.

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GUARANTEED TECHNICAL PARTICULARS OF THREE PHASE METER BOX MADE OUT OF SHEET MOULDING COMPOUND (SMC)

SR. NO.	GUARANTEED TECHNICAL PARAMETERS	GTP VALUES
(1)	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TEXT
(2)	APPLICABLE STANDARDS	TEXT
(3)	METER BOX IS MADE FROM GRADE S3 SMC MATERIAL	BOOLEAN
(4)	METER BOX IS WEATHER PROOF, UNBREAKABLE, SCRATCH RESISTANT HAVING GOOD WORKMANSHIP WITH ROOF TAPERING DOWN ON BOTH SIDES FOR EASY FLOW OF RAINWATER.	BOOLEAN
(5)	METER BOX MATERIAL IS UV STABILIZED TO ENSURE THAT IT DOES NOT GET 'YELLOW' OVER A PERIOD OF TIME.	BOOLEAN
(6)	METER BOX DOES NOT CHANGE IN COLOUR, SHAPE, SIZE, DIMENSIONS WHEN SUBJECTED TO 200 HRS ON UV AGEING TEST AS PER ASTM: G53 (CL. NO. 9.3).	BOOLEAN
(7)	TYPE TEST REPORT IN SUPPORT OF UV AGEING TEST AS PER ASTM: G53 (CL. NO. 9.3) ENCLOSED	BOOLEAN
(8)	METER BOX IS CAPABLE OF WITHSTANDING TEMPERATURE OF BOILING WATER FOR FIVE MINUTES CONTINUOUSLY WITHOUT DISTORTION OR SOFTENING.	BOOLEAN
(9)	TYPE TEST REPORT IN SUPPORT OF ABOVE (8)	TEXT

(10)	THICKNESS OF BASE	TEXT
(11)	THICKNESS OF COVER	TEXT
(12)	METER BOX HAS CLEARANCES AS PER SPECIFICATION	BOOLEAN
(13)	OVERALL DIMENSIONS OF METER BOX LXBXH	TEXT
(14)	BASE AND COVER OF METER BOX ARE INDIVIDUALLY IN ONE PIECE.	BOOLEAN
(15)	COVER IS MADE OVERLAPPING TYPE HAVING COLLARS ON ALL FOUR SIDES.	BOOLEAN
(16)	THE BOX AND COVER SHALL BE FIXED BY CONCEALED STAINLESS STEEL HINGES AND HARDWARE FROM INSIDE IN SUCH A MANNER THAT IT CANT BE MANIPULATED FROM OUTSIDE.	BOOLEAN
(17)	THE DOOR SHALL HAVE LOCKING ARRANGEMENT BY WAY OF DOOR CLOSING U CLAMP OF STAINLESS STEEL MATERIAL.	BOOLEAN
(18)	THE METER BOX BASE AND COVER SHALL HAVE MINIMUM 02 NO WIRE SEALING HOLES FOR SEALING PURPOSE.	BOOLEAN
(19)	COVER IN CLOSED POSITION OVERLAPS BASE SUCH THAT DIRECT ENTRY OF SCREWDRIVER, TOOL OR FILM IS NOT POSSIBLE.	BOOLEAN
(20)	COVER IS PROVIDED WITH SEMI CIRCULAR / CIRCULAR GASKET OF SUFFICIENT SIZE TO COMPLETELY FIT TO GROOVES OF THE BASE.	BOOLEAN
(21)	SEMI CIRCULAR / CIRCULAR GASKET IS MADE OUT OF GOOD QUALITY NEOPRENE RUBBER	BOOLEAN
(22)	COLOUR OF THE METER BOX IS SIEMENS GREY	BOOLEAN

(23)	METER BOX CONFIRMS TO IP-55.	BOOLEAN
(24)	IP-55 TYPE TEST REPORT NO. & DATE	TEXT
(25)	2 NOS. OF HOLES WITH POLYMERIC / RUBBER GROMMETS TO BE PROVIDED AT THE BOTTOM OF METER BOX FOR INCOMING AND OUTGOING CABLES.	BOOLEAN
(26)	VIEWING WINDOW OF MINIMUM SIZE 140MM X 120MM .TOUGHENED GLASS OF MINIMUM 5 MM THICKNESS	BOOLEAN
(27)	METER BOX TYPE TESTED	BOOLEAN
(28)	TYPE TEST REPORT NO. & DATE	TEXT
(29)	TYPE TEST REPORT ENCLOSED	BOOLEAN
(30)	CONFIRM FLAMMABILITY AS PER UL 94 / IS 11731	TEXT
(31)	CONFIRM SELF EXTINGUISHING AS PER IS 4249.	TEXT
(32)	CONFIRM HEAT DEFLECTION TEMPERATURE @ 1.8 MPA AS PER IS: 13411, ANNEXURE 'H' / ISO 75.	TEXT
(33)	CONFIRM GLOW WIRE TEST AS PER IS: 11000 (PART 2 / SECTION 1) / IEC 695-2-1.	TEXT
(34)	CONFIRM BALL PRESSURE TEST AS PER IS: 14772/2020 OR IEC 335	TEXT

(35)	CONFIRM 200 HRS UV AGEING TEST IS CARRIED OUT AS PER ASTM G53 (9.3)	TEXT
(36)	CONFIRM WATER ABSORPTION VALUE AS PER IS: 14772 / 2020	TEXT
(37)	CONFIRM MECHANICAL STRENGTH AS PER IS: 14772 / 2020	TEXT
(38)	CONFIRM FLEXURE STRENGTH.	TEXT
(39)	CONFIRM MODULUS OF ELASTICITY	TEXT
(40)	CONFIRM IZOD IMPACT STRENGTH NOTCHED MINIMUM.	TEXT
(41)	GUARANTEE PERIOD AS PER TENDER DOCUMENT	BOOLEAN
(42)	IN-HOUSE TESTING FACILITY IS AVAILABLE.	BOOLEAN

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

THREE PHASE FOUR WIRE CT / PT OPERATED
0.5 S CLASS, 1 AMP OR 5 AMPS TRI VECTOR SMART
ENERGY METER WITH BUILT IN COMMUNICATION
MODULE AS PER IS 16444 PART-II

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1.00 SCOPE

This specification covers design; manufacture, testing, supply and delivery of ISI mark HT three phase four wire CT / PT operated 1 Amps or 5 Amps 0.5S fully Static & AMR compatible TOD Tri - vector Energy Meter with bi directional integrated communication capability as per parameters defined in the standard IS-16444-Part II. The meter should be configurable in field through secured transaction as defined in IS-16444 Part II. The bidirectional communication module should be integral part of meter with suitable sealing arrangement. The meters shall be suitable for measurement of Active Energy (kWh), Reactive Energy (kVArh) Lag and (kVArh) Lead separately, Apparent Energy (kVAh), demand (kW), demand (kVA), etc. as per Power tariff requirement for AC balanced / unbalanced loads of HT Consumers.

The meter shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 APPLICATION

For use on HT consumer installations.

3.00 SERVICE CONDITIONS

As per IS: 16444:2017 (amended up to date), the meter must perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS). The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Environmental Conditions

(a) Maximum ambient temperature	55^0 C
(b) Maximum ambient temperature in shade	50^0 C
(c) Minimum temperature of air in shade	5^0 C
(d) Maximum daily average temperature	40^0 C

(e) Maximum yearly weighted average temperature 32^0 C

(f) Relative Humidity 10 to 95 %

(g) Maximum Annual rainfall 1450 mm

(h) Maximum wind pressure 150 Kg/m^2

(i) Maximum altitude above mean sea level 1000 mtrs

(j) Isoceraunic level 50 days/year

(k) Seismic level (Horizontal acceleration) 0.3 g

(l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

4.00 STANDARD TO WHICH METER SHALL COMPLY

IS 16444 Part-II- A.C. Static Transformer Operated Watthour and Var-Hour Smart Meters, Class 0.2s, 0.5s and 1.0s Part 2 Specification Transformer Operated Smart Meter.

IEC 62052 -11, IEC 62053-21 (ACTIVE ENERGY) & IEC 62053-24 (REACTIVE ENERGY).

CEA metering regulations 2022 for AMR metering.

5.00 GENERAL TECHNICAL REQUIREMENT

1)	TYPE	Three Phase, Four Wire 1 Amp or 5 Amps fully Static AMR compatible TOD Tri - Vector Smart Energy Meter with Optical & inbuilt communication module as per Category D3 of IS: 15959 / 2011 PART 3/2017 (with DLMS protocol) for use on HT Consumers installation.
2)	FREQUENCY	50 Hz ±5%
3)	ACCURACY CLASS	0.5S (FOR ACTIVE AND REACTIVE ENERGY)
4)	PT SECONDARY VOLTAGE	63.5 V Ph-N
5)	RATED VOLTAGE	110 V Ph-Ph or 3 x 63.5 V Ph-N
6)	VOLTAGE RANGE	+15% to – 30% of rated voltage.

110 V

7)	PT RATIO	$\frac{11}{\sqrt{3}}$ kV/$\frac{}{\sqrt{3}}$
8)	CT RATIO	1 / 1 Amps; 5 / 5 Amps
9)	BASIC CURRENT (I_b)	1 Amp; 5 Amps.
10)	MAXIMUM CONTINUOUS CURRENT (I_{max})	2 times (200 %) of Ib.
11)	SHORT TIME CURRENT	As per IS: 16444 Part –II, 2017
12)	STARTING CURRENT	0.1% of Ib.
13)	POWER CONSUMPTION	The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 5.0 W and 15 VA during idle mode of communication module. The additional power requirement during data transmission shall not exceed 7 watt per communication module. The apparent power taken by each current circuit, at basic current Ib, reference frequency and reference temperature shall not exceed 2 VA.
14)	POWER FACTOR	Power Factor range: Zero Lag to unity to Zero Lead to unity Avg. P.F = $\frac{\text{Total(kWh)}}{\text{Total (kVAh)}}$ $kVAh = \sqrt{(Kwh)^2 + (RKVAhlag + RKVAhlead)^2}$
15)	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving parts; electronic components shall be assembled on printed circuit board using surface mounting

		technology; factory calibration using high accuracy (0.1 class) software based test bench.
16)	POWER SUPPLY	SMPS
17)	ISI MARK	The meter shall bear ISI Mark
18)	TEMPERATURE	The standard reference temperature for performance shall be 27^0 C. The mean temperature co-efficient shall not exceed 0.03%.

6.00 CONSTRUCTIONAL REQUIREMENT

6.01 GENERAL MECHANICAL REQUIREMENT

The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

(a) personal safety against electric shock:

(b) personal safety against effects of excessive temperature;

(c) safety against spread of fire;

(d) Protection against penetration of solid objects, dust and water.

(e) Detection of fraud / pilferage

6.02 The meter shall be projection type and shall be dust and moisture proof. All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

6.03 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non ageing and of tested quality.

6.04 METER CASE

6.04.01 The meter base & cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The construction of the meter shall be such that it can be sealed independently and the cover cannot be removed without breaking the seal. Meter base shall be opaque and meter top cover shall be transparent /opaque.

6.04.02 The poly carbonate body of the meter shall conform to IS: 11731 / 1986 (FV-2 Category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1)

2008 OR IEC PUB 60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2) 1986.

6.04.03 The Poly-carbonate opaque base and transparent/Opaque cover of meter shall be ultra-sonically welded (continuous welding) or meter case and cover shall have break to open functionality with clear physical evidence on forcibly opening of cover. So that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).

6.04.04 The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust, moisture & vermin. The type test certificate shall be submitted along with the offer.

6.04.05 The meter cover shall be secured to base by means of sealable screws with two holes.

6.05 TERMINALS & TERMINAL BLOCK

6.05.01 The terminal block shall be made from high quality non-hygroscopic, fire retardant, reinforced polycarbonate / non-Bakelite material which shall form an extension of the meter case.

6.05.02 The material of which the terminal block is made shall be capable of passing the tests given in IS: 1336O (Part 6/Sec 17), ISO 75-1 (1993) & ISO 75-2 (1993) for a temperature of 135^0C and a pressure of 1.8 MPa (Method A).

6.05.03 The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

6.05.04 The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

6.05.05 Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of meter shall screw into metal nuts.

6.05.06 All parts of every terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

6.05.07 Electrical connections shall be so designed that contact pressure is not transmitted through insulating material of the terminal block.

6.05.08 The terminals, the conductor fixing screws or the external or internal conductors shall not be liable to come into contact with terminal covers.

6.05.09 Two screws shall be provided in each current & potential terminal for effectively clamping the external leads or thimbles.

6.05.10 Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall be such as not to pierce and cut the conductors used.

6.05.11 The minimum internal diameter of terminal hole shall be as per IS: 16444 PART 2:2017

6.05.12 The manufacturer shall ensure that the supporting webs between two terminals of the terminal block shall be sufficiently high to ensure that two neighboring terminals do not get bridged by dust and there shall not be any possibility of flash over between adjacent terminals of the terminal block. Overall the quality of the meter should be good and the service life of the meter shall be 10 years.

6.06 TERMINAL COVER

The termination arrangement shall be provided with an extended transparent terminal cover as per IS 16444 Part II.

6.06.01 The terminal cover shall be made out of same material as that of meter body. The terminal cover shall be unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The terminal cover shall be transparent.

6.06.02 The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

6.06.03 The terminal cover shall be provided with one side hinge/two top hinges.

6.06.04 Independent sealing provision shall be made against opening of the terminal cover and meter body cover to prevent unauthorized tampering. It is necessary to provide bidirectional screws with two holes for sealing purpose of terminal cover. The meter shall be pilfer-proof & tamper-proof.

6.06.05 The fixing screws used on the terminal cover for fixing and sealing in terminal cover shall be held captive in the terminal cover.

6.06.06 Proper size of grooves/U-Cut shall be provided at bottom of this terminal cover for incoming service connections.

6.06.07 When the meter is mounted, no access to the terminals by any means shall be possible without breaking seals(s) of the terminal cover.

6.07 RESISTANCE TO HEAT AND FIRE

The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

6.08 The meter shall be completely factory sealed except the terminal block cover.

6.09 The provision shall be made on the meter for at least two seals to be put by utility user.

6.10 A Push button facility shall be provided for high resolution reading / alternate mode of display, as brought out elsewhere in this specification. Facility of scrolling of all the readings up and down in all the display modes shall be provided.

6.11 OUTPUT DEVICES

The meter shall have test output accessible from the front and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from front. The test output device shall be provided in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. The pulse rate of output device which is Pulse / kWh and Pulse / kVArh (meter constant) shall be programmed according to primary values of voltage & current & shall be indelibly provided on the nameplate.

6.12 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per IS 16444 Part-II then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

6.13 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases & neutral for five minutes without affecting the accuracy.

6.14 In meter, power supply unit shall be micro control type instead of providing transformer and then conversion to avoid magnetic influence.

6.15 Non specified display parameters in the meter shall be blocked and it shall not be accessible for reprogramming at site. However these parameters shall be programmable at site through representative of meter manufacturer.

6.16 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc.

6.17 Internal CTs if used are to be provided with magnetic shielding and they shall be tested separately prior to assembly by the meter manufacturer.

6.18 PCB used in meter shall be made by Surface Mounting Technology.

6.19 REAL TIME INTERNAL CLOCK (RTC)

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 seconds per year.

The clock day / date setting and synchronization shall only be possible through password / Key code command from one of the following:

a) Hand Held Unit (HHU), Laptop Computer or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger 'PC'.

The RTC battery & the battery for display in case of power failure shall be separate.

6.20 The meter shall remain immune for the test of electromagnetic HF/RF defined under the test IS 16444 Part II: 2017 amended up to date.

6.21 The communication of energy meters shall not be affected considering the above feature.

6.22 The meter shall withstand any type of High Voltage and High Frequency surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter.

The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 kV.

The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(i) On any of the phases or neutral terminals

(ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(iii)At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device.

6.23 SELF DIAGNOSTIC FEATURES

6.23.01 The meter shall keep log in its memory for unsatisfactory functioning or non-functioning of Real Time Clock battery or low battery indication on display, also it shall be recorded and indicated in reading file at base computer software.

6.23.02 All display segments: "LCD Test" display shall be provided for this purpose.

6.24 The watch dog provided shall invariably protect the hanging of microprocessor during such type of tampering devices.

6.25 METER PROTOCOL

The meter protocol shall be as per IS 16444 Part II: 2017 amended up to date.

6.26 COMMUNICATION CAPABILITY

7.00 The meter shall be provided with two ports for communication of the measured / collected data as per IS 16444 Part II:2017, i.e inbuilt Communication Module (4G/2G/3G/NB-IoT/PLCC/LPRF) and an Optical port complying with hardware specifications detailed in IEC – 1107 or 62056 - 21. This shall be used for local data downloading through a DLMS compliant HHU, Mobile Application, Sealing arrangement for Optical & Communication Module as required shall be provided.

During data communication process through either AMR or MRI, the meter energy recording should not get affected.

Optical Port shall support the default and minimum baud rate of 9600 bps.

Communication Module: - The smart Meter shall have bidirectional communication module which shall integrate with meter. The communication module shall accommodate 4G/2G/3G/NB-IoT/PLCC/LPRF for bidirectional communication with HES. Meter shall be capable to record the communication module removal as an event.

7.01 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal battery may be provided.

The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided.

Non rechargeable Battery (Primary battery) shall also be accepted with battery life of minimum 15 years

7.02 WIRE / CABLE LESS DESIGN

The meter PCB shall be wireless to avoid improper and loose connections/ contacts.

7.03 Meter shall record & display total energy including Harmonic energy.

7.04 Reverse reading lock of main KWh and kVAh reading is to be incorporated with necessary software modification if required additionally.

7.05 The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

8.00 TOD TIMINGS

There shall be provision for at least 6 (SIX) TOD time zones for energy and demand. The number and timings of these TOD time zones shall be programmable by manufacturer both at site / factory.

At present the time zones shall be programmed as below:

ZONE “A” (TZ1): 0000 Hrs to 0600 Hrs and 2200 Hrs to 2400 Hrs.

ZONE “B” (TZ2): 0600 Hrs to 0900 Hrs and 1200 Hrs to 1800 Hrs.

ZONE “C” (TZ3): 0900 Hrs to 1200 Hrs.

ZONE “D” (TZ4): 1800 Hrs to 2200 Hrs.

9.00 DEMAND INTEGRATION PERIOD

The maximum demand integration period shall be set at 15 minutes with block window method.

10.00MD RESET

The meter shall have following MD resetting options.

i) Communication driven reset;

ii) Manual resetting arrangement with sealing facility;

iii) Automatic reset on First day of every month at 00.00 Hrs. This option shall be blocked by default and made programmable through hand held terminal / CMRI for the actual date required.

11.00 TAMPER AND FRAUD MONITORING FEATURES

11.01 ANTI TAMPER FEATURES.

The meter shall detect and correctly register energy under following tamper conditions:

(a) The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(b) The meter shall continue to work even without neutral as per prevailing electrical conditions.

(c) The meter shall work in absence of any two phases i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(d) The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per IS 16444 Part II: then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

(e) If a consumer tries to steal power by disconnecting the voltage supply of one or two phases of the meter externally or by tampering so that no voltage or partial voltage (< 50% of Vref) is available to voltage circuit of meter & current is flowing in that phase, the meter shall record energy (kVAh & kWh) at Vref, current available in these phases & unity power factor.

The meter shall remain immune for the test of electromagnetic HF/RF IS 16444 Part II:

TAMPER EVENTS

11.01.01 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS.

11.01.02 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh power factor, event code, date & time etc. listed in IS 16444 Part II.

11.01.03 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping as per IS 16444 Part II and the meter shall continuously display that the cover has been tampered.

11.01.04 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter.

11.01.05 Tamper details shall be retrieved by authorized personnel through either of the following:

i) HHU.

ii) Remote access through suitable communication network.

11.01.06 Minimum 200 numbers of events (occurrences & restoration with date & time) shall be available in the meter memory. The recording of abnormal events shall be on FIFO basis as per IS 16444 Part II. The unrestored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months).

All the information of data shall be made available in simple & easy to understand format.

11.02 The threshold values for various tampers are as below.

Sr. No.	**Description**	**Occurrence (With Occ. Time 5 min.)**	**Restoration (With Rest. Time 5 min.)**
1.	PT link Missing (Missing potential)	< 50% of Vref and current in that phase is > 1% Ib	> 50 % of Vref
2.	Over voltage in any phase	> 115 % of Vref	< 115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance	Vmax - Vmin > 10 % Vmax	Vmax - Vmin < 10 % Vmax
5.	CT reverse	Change in direction of current	Current flow in forward direction.
6.	CT Open.	Zero Amps in one or two phases and current in at least 1 phase is	> 3 % Ib for 15 min in the tampered phase for 15 min.

		> 5% Ib for 15 minutes.	
7.	Current Unbalance. (Diff. of phase currents)	> 30 % Iref* for 15 min	< 30 % Iref* for 15 min
8.	Current Bypass	Bypass Current > 50 % Iref* for 15 min	Bypass Current < 30 % Iref* for 15 min
9.	Over Current in any Phase	> 120 % I_b	< 120 % I_b
10.	Influence of permanent magnet or AC / DC electromagnet / permanent magnet	Immediate	1 minute after removal
11.	Neutral Disturbance	--	--
12.	Power failure	Immediate	Immediate
13.	Very Low PF	--	--
14.	Meter Cover Opening	(2 to 4 mm) Immediate (Occurance only)	
* Higher of 3 phase currents shall be taken as reference for this purpose.			

12.00 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc as per details given in the table No 1 of IS: 15959 / Part -3/2017.

b) Block Load Profile Parameters such as kVAh, kWh, kVArh (lag), kVArh (lead), Maximum Demand (MD) in kW / kVA / power factor / phase and line voltages / currents etc. as per details given in Table 2 of IS 15959 Part-3/2017.

c) Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh, etc. as per details given in Table 4 of IS 15959 Part-3/2017.

13.00 DISPLAY OF MEASURED VALUES

13.01 DISPLAY INDICATORS

The supply indication shall be displayed permanently by LCD as a minimum and shall be visible from the front of the meter. In case of non available of voltage to any phase(s), the LCDs of that particular phase shall stop glowing or those particular indicator(s) shall start blinking on the LCD display of meter.

13.02 Permanently backlit LCD panel shall show the relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years.

The meter shall have minimum 6 digits (with +/- indication), parameter identifier, permanently backlit Liquid Crystal Display (LCD) with wide viewing angle. The size of digit shall be minimum 8x5 mm. The decimal units shall not be displayed in auto scroll mode. However it shall be displayed in push button mode or alternate mode for high resolution display for testing. Auto display cycling push button is required with persistence time of 10 Seconds. LCD shall be suitable for temperature withstand of 70^0 C; adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

13.03 The meters shall be pre-programmed for following details.

a) PT Ratio: $\frac{11}{\sqrt{3}}$kV/$\frac{110}{\sqrt{3}}$V

b) CT Ratio: 1/1 Amps or 5/5 Amps as per requirement.

c) MD resetting shall be auto as per clause no. 9.00 (iii).

d) MD Integration Period is 15 Minutes real time based.

e) Average power factor with 3 decimal digits shall be displayed.

f) The array of data to be retained inside the meter memory shall be for the last 32 days for a capture period of 15 minutes. Load survey data shall be first in first out basis (FIFO).

g) The display of various parameters in Normal Mode & Alternate mode shall be as per IS 16444 Part II:

SN	PARAMETERS
A	**NORMAL DISPLAY (DEFAULT DISPLAY)**
1.	LCD Test
2.	Real Time Clock – Date & Time
3.	Voltage – V_R
4.	Voltage – V_Y
5.	Voltage – V_B
6.	Current – I_R
7.	Current – I_Y
8.	Current – I_B
9.	Cumulative Energy – kWh
10.	Cumulative Energy – kWh - TOD Zone A (TZ1)
11.	Cumulative Energy – kWh - TOD Zone B (TZ2)
12.	Cumulative Energy – kWh - TOD Zone C (TZ3)
13.	Cumulative Energy – kWh - TOD Zone D (TZ4)
14.	Cumulative Energy – kVArh - Lag
15.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
16.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)

17.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
18.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)
19.	Cumulative Energy –kVArh - Lead
20.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
21.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
22.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
23.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)
24.	Cumulative Energy – kVAh
25.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
26.	Cumulative Energy – kVAh - TOD Zone B (TZ2)
27.	Cumulative Energy – kVAh - TOD Zone C (TZ3)
28.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
29.	Current MD – kVA with occurance date & time
30.	MD - kVA – TOD Zone A (TZ1) with occurance date & time
31.	MD - kVA – TOD Zone B (TZ2) with occurance date & time
32.	MD - kVA – TOD Zone C (TZ3) with occurance date & time
33.	MD - kVA – TOD Zone D (TZ4) with occurance date & time
34.	Number of MD – kVA reset
35.	Rising MD with elapsed time
36.	Three Phase Power Factor – PF
37.	Cumulative Tamper Count
38.	Meter Cover Opening – Occurance with date and time.
B	**ON DEMAND DISPLAY (ALTERNATE MODE)**
1.	Last date & time of MD - kVA reset

2.	Current – I_R
3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_R
6.	Voltage – V_Y
7.	Voltage – V_B
8.	Signed Power Factor – R Phase
9.	Signed Power Factor – Y Phase
10.	Signed Power Factor – B Phase
11.	Frequency
12.	High resolution kWh (for calibration)
13.	High resolution kVArh Lag(for calibration)
14.	High resolution kVArh Lead(for calibration)
15.	High resolution kVAh (for calibration)
16.	Running Demand kVA (for calibration)
17.	M1 MD - kVA – TOD Zone A (TZ1) with occurance date & time
18.	M1 MD - kVA – TOD Zone B (TZ2) with occurance date & time
19.	M1 MD - kVA – TOD Zone C (TZ3) with occurance date & time
20.	M1 MD - kVA – TOD Zone D (TZ4) with occurance date & time
21.	M2 MD - kVA – TOD Zone A (TZ1) with occurance date & time
22.	M2 MD - kVA – TOD Zone B (TZ2) with occurance date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurance date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurance date & time
25.	Last Tamper Event with date and time.

g) Other KVA MD values shall be available in reset backup data for 12 months.

h) The meter display shall return to Default Display mode (mentioned above) if the 'Push button' is not operated for 15 seconds.

14.00 BILLING DATA, BILLING HISTORY & BLOCK LOAD SURVEY

14.01 BILLING DATA

The billing data shall be as per table 4 of IS 15959 Part-3 for Category D3:

Sr. No.	Parameters
1.	Billing Date
2.	System Power Factor for Billing Period
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh – Lag
9.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
10.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
11.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
12.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)
13.	Cumulative Energy – kVArh – Lead
14.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
15.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
16.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
17.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)

18.	Cumulative Energy – kVAh
19.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
20.	Cumulative Energy – kVAh – TOD Zone B (TZ2)
21.	Cumulative Energy – kVAh – TOD Zone C (TZ3)
22.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
23.	MD – kVA with occurance date & time
24.	MD – kVA – TOD Zone A (TZ1) with occurance date & time
25.	MD – kVA – TOD Zone B (TZ2) with occurance date & time
26.	MD – kVA – TOD Zone C (TZ3) with occurance date & time
27.	MD – kVA – TOD Zone D (TZ4) with occurance date & time
28.	MD – kW occurance date & time
29.	MD – kW – TOD Zone A (TZ1) with occurance date & time
30.	MD – kW – TOD Zone B (TZ2) with occurance date & time
31.	MD – kW – TOD Zone C (TZ3) with occurance date & time
32.	MD – kW – TOD Zone D (TZ4) with occurance date & time

14.02 BILLING HISTORY

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 12 months.

14.03 BLOCK LOAD SURVEY

The Block 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, however if there is no power for few block within one day those block should be displayed with 0 values with marking of power fail indication for that block i.e. for every day when there was power on, the meter must record 48 blocks. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. This 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 (XML) format.

The Block Load survey data shall be for specified parameters as per Table No 2 of IS 15959 Part 3: The specified parameters are as below.

Sr. No.	Parameters
1.	Real Time Clock – Date and Time
2.	Current - I_R
3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_{RN}
6.	Voltage – V_{YN}
7.	Voltage – V_{BN}
8.	Block Energy – kWh
9.	Block Energy – kVArh – Lag
10.	Block Energy – kVArh – Lead
11.	Block Energy – kVAh

15.00 DEMONSTRATION

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

16.00 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS 16444 Part-II. The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS 16444 Part II.

COMPUTER SOFTWARE

16.01 For efficient and speedy recovery of data downloaded through HHU on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier.

16.02 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall be suitable for all types of printers such as dot matrix, inkjet, deskjet and laser printers.

16.03 The Base Computer Software shall be "Windows" based & user friendly.The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as HHU by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS.

16.04 The Base Computer Software should be password protected.

16.05 The total time taken for downloading Billing, Tamper and Load Survey Data for 32 days shall be less than or equal to 9 minutes.

16.06 Downloading time of only Billing data shall be less than or equal to 20 secs.

16.07 The BCS software shall create one single file for the uploaded data, e.g. if CMRI contains the meter readings of, say, 2,000 consumer meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading in ASCII format or XML file as per MIOS for individual meter reading.

16.08 Also there shall be a provision to give filenames while creating the file.

16.09 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3

16.10 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

16.11 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHU.

16.12 The software provided on laptop or PC shall be compatible to read the data from USB drive and for that purpose a sample cable (1 No.) shall be provided with USB termination. USB being the de-facto standard, this is the requirement.

16.13 MSEDCL is procuring large quantity of meters. As such manufacturer have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software

used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing & Quality Control Cell / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

17.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the above diagram. The diagram & terminal marking on sticker shall not be allowed.

18.00 NAME PLATE AND MARKING OF METERS

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. Meter Serial Number shall be Bar Coded along with numeric number. The size of bar coded number shall not be less than 35x5 mm. The manufacturer's meter constant shall be marked on the name plate. Meter serial number & bar code on sticker will not be allowed.

In addition to the requirement as per IS, following shall be marked on the name plate.

(i) Purchase order no. & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Period as per tender document

(v) ISI mark

(vi) Category of Meter: **Category D3-HT(PT/CT) Consumer Meter As per IS 16444 Part-II**

The lettering shall be bold in 3 mm font.

19.00 TESTS

19.01 TYPE TESTS

The meter offered shall have successfully passed all the type tests described in IS 16444 Part II: 2017

The type test reports shall clearly indicate the constructional features of the type tested meter. Separate type test reports for each offered type of meter shall be submitted.

The type test certificates as per IS 16444 Part II amended upto date shall be submitted along with the offer and the same shall not be more than 5 years at the time of submission.

All the type test reports shall be got approved from the Chief Engineer, MSEDCL, Testing & Quality Control Cell, Prakashgad, Mumbai.

All the Type Tests specified in the technical specifications shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as ERDA, ERTL, CPRI, etc. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix - C of Latest – standardization of AC static electrical energy meters –NPL / CQAL / ERTL / ERDA at the sole discretion of the purchaser at the purchaser's cost. The supplier shall have no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

19.02 ACCEPTANCE TESTS

Criteria for selection for such tests and performance requirements shall be as per IS 16444 Part II

19.03 ROUTINE TESTS

All routine tests as per IS 16444 Part II shall be carried out on all the meters.

19.04 ADDITIONAL ACCEPTANCE TESTS

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 16444 Part-II (amended up to date)

(a) **OTHER ACCEPTANCE TESTS**

i) Meters shall be tested for tamper conditions as stated in this specification.

ii) Glow wire testing for poly-carbonate body.

iii) Power consumption tests shall be carried out.

The meter shall comply all the tests for external AC / DC magnetic field as per IS 16444 Part II .Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor in all the three phases. After removal of magnet, meter shall be subjected to accuracy test as IS 16444 Part II. No deviation in error is allowed in the class index as per IS 16444 Part II.

iv) The meter shall withstand impulse voltage at 6 kV.

v) The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 for EMI/EMC of IS 16444 Part II.

Jammer test for sample meters shall be carried out at MSEDCL's Testing Division.

The tests 20.04 (b) (i) to (iii) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 20.04 (b) (iv) to (vi) shall be carried out on one sample from first lot as per procedure laid down in IS 16444 Part II. The test report shall be got approved from Chief Engineer, Testing & Quality Control Cell before commencement of supply.

(i) For influence quantities like, voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error shall be as per IS 16444 Part II.

20.00 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of meters in schedule 'A' attached. The offers without the details in Schedule 'A' stand rejected.

21.00 PRE-DESPATCH INSPECTIONS

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases. The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MSEDCL's representative / Engineer attending the above testing will carry out testing as per IS 16444 Part II this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division & the Executive Engineer, Inspection Wing.

22.00 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing)

From each lot (lot means the total number of meters received in a Store out of inspected and approved lot by E.E.(IW) or purchaser's representative under one approval letter) of meters received at Stores, 5 sample meters shall be drawn (meters received in damage condition shall not be selected as samples) and these meters will be tested by our Testing Engineer in presence of Supplier's representative jointly for (i) no load condition test, (ii) limits of error test (iii) starting current test, (iv) repeatability of error test (v) tamper conditions and (vi) data downloading time as per this specification.

The 5 days advance intimation will be given to the supplier and if the suppliers fail to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of supplier's representative. If the meters failed in above random sample testing, the lot will be rejected.

23.00 GUARANTEE

The meters supplied shall be guaranteed as per tender document. Bidders shall guarantee to replace free of cost the meters which are found defective / inoperative at the time of installation, or become inoperative / defective during guarantee period. Replacements shall be effected within one month from the date of intimation. If the defective meters are not replaced within the specified period above, MSEDCL shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

24.00 PACKING

24.01 The meters shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter & HHU may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental

opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

24.02 The following information shall be furnished with the consignment:

- Name of the consignee
- Details of consignment
- Destination
- Total weight of the consignment
- Sign showing upper / lower side of the crate
- Sign showing fragility of the material
- Handling and unpacking instructions
- Bill of Materials indicating contents of each package & spare material.

25.00 TENDER SAMPLE

Tenderer are required to submit meter samples as per the quantity as mentioned in tender document of offered type / item and they shall be as per technical specifications from any one of the factories on or before the time & date stipulated for submission of offer for testing the sample meters in third party NABL Lab like ERDA, CPRI, CIPET, ERTL, etc. The offer of those eligible bidders shall only be considered if the sample passes the tests at NABL Lab. The results of NABL Lab shall not be disputed and same shall be binding on the bidder. The required information such as Manufacturer's Name or Trade Name, Sr. No., ISI Certification No., etc. shall be on stickers to be affixed on outer portion of sample meters being submitted along with the offer. Such information shall not be embossed or printed on any part of the sample meter.

Out of these, one sample shall be without Ultrasonic/Chemical welding to confirm constructional features.

26.00 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team should be given all assistance and co-operation for inspection and testing at the bidder's works.3 tender samples should be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples.

27.00 MINIMUM TESTING FACILITIES

27.01 Manufacturer shall possess fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS 16444 Part II (amended up to date).In addition, this facility shall produce Test Reports for each and every meter. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly. The list of testing equipment. shall be enclosed. The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests:

Sr. No.	Name of Test
(1)	A.C. Voltage test
(2)	Insulation Resistance Test
(3)	Test of Accuracy Requirement
(4)	Test on limits of errors
(5)	Test on meter constant
(6)	Test of starting condition
(7)	Test of no-load condition
(8)	Repeatability of error test
(9)	Test of power Consumption
(10)	Vibration test
(11)	Shock Test
(12)	Transportation Test - as per MSEDCL specification
(13)	Tamper conditions - as per MSEDCL specification
(14)	Glow Wire Test
(15)	Long duration test
(16)	Flammability Test
(17)	The manufacturer shall have duly calibrated RSS meter of class 0.01 accuracy

27.02 METER SOFTWARE

The Bidders will have to get appraised & obtain CMMI – Level III within one year from date of letter of award.

27.03 Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, shall the circumstances warrant such assessment in the overall interest of the Purchaser.

28.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING

28.01 Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components, etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block / stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

The manufacturer shall submit the list of plant and machinery along with the offer.

28.02 MANUFACTURING ACTIVITIES

Quality shall be ensured at the following stages:

(a) At PCB manufacturing stage each board shall be subjected to computerized bare board testing.

(b) At insertion stage all components should under go computerized testing for conforming to design parameters and orientation.

(c) Complete assembled and soldered PCB should under go functional testing using Automatic Test Equipments (ATEs)

(d) Prior to final testing and calibration, all meters shall be subjected to ageing test (i.e. Meters shall be kept in ovens for 72 hours at 55^0C temperature and atmospheric humidity under real life condition at it's full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.

(e) The calibration of meters shall be done in-house.

(f) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.

(g) Bought out items: A detailed list of bought out items which are used in the manufacture of the meter shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

(h) List of Plant and Machinery:

Sr. No.	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meters	Routine Testing and Calibration of Meters
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meters
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meters Class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meters
9	Automatic Pick and Place Machines	Automatic placing of SMT components

10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meters
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meters
30	Short term over Current testing setup	Type testing of Meters

31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meters
33	Composite Environmental testing chambers	Type testing of Meters

29.00 QUALITY ASSURANCE PLAN

29.01 The tenderer shall invariably furnish QAP as specified in Annexure I along with his offer. The QAP shall be adopted by him in the process of manufacturing.

29.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

30.00 COMPONENT SPECIFICATION.

As per Annexure II enclosed.

31.00 SCHEDULES.

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'A' … Guaranteed and technical particulars. (As per GTP uploaded on e -tendering site)

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard shall not be entertained. If it is observed that there are deviations in the offer in Guaranteed Technical Particulars, then, such deviations shall be treated as deviations.

ANNEXURE I

QUALITY ASSURANCE PLAN

A) The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates:

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and list of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offers.

ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii) Quality assurance plan(QAP) withhold points for purchaser's inspection.

The quality assurance plan and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following:

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization.

- The duties and responsibilities assigned to staff ensuring quality of work.
- The system for purchasing taking delivery and verification of material.
- The system for ensuring quality workmanship.
- The system for retention of records.
- The arrangements for contractor's internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii) Quality Plans:

- An outline of the proposed work and programme sequence. The structure of the contractor's organization for the contract.
- The duties and responsibilities assigned to staff ensuring quality of work.
- Hold and notification points.
- Submission of engineering documents required by the specification.
- The inspection of materials and components on receipt. Reference to the contractor's work procedures appropriate to each activity.
- Inspection during fabrication/ construction.
- Final inspection and test.

ANNEXURE II

COMPONENT SPECIFICATION

The make/grade and the range of the components should be from the following list makes or **equivalent reputed makes**

Sr. No.	Component function	Requirement	Makes and Origin
1	Current Transformers	The Meters shall be with the current transformers as measuring elements.	The current transformer shall withstand of IS 16444 Part-II
2	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	**USA:** Analog Devices, Cyrus Logic, Atmel, Philips, Teridian. Dallas, ST, Texas Instruments, Motorola, Maxim, National Semiconductors, Freescale, Onsemiconductors **Germany:** Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria:** AMS **Holland:** Philips (N X P) **Taiwan:** Prolific
3	Memory chips	The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. There shall be security isolation between metering circuit, communication circuit, and power circuit.	**USA:** Atmel, Teridian, Philips ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron. **Japan:** Hitachi, Renasas. **Germany:** Siemens

4	Display modules	a) The display modules shall be well protected from the external UV radiations. b) The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters. c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type). d) It shall be trans-reflective HTN (Hyper Twisted Nematic (120°)) or STN (Super Twisted Nematic (160°)) type industrial grade with extended temperature range.	Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics **Singapore:** E-smart, Bonafied Technologies, Display Tech, **Korea:** Advantek, Jebon, Union Display Inc., **Japan:** Hitachi, Tianma, Sony, L&G, Holtek, Haijing. **Malaysia:** Crystal Clear Technology. **Hong kong:** Genda **China:** Success, Tianma Or any other reputed make
5	Communication Modules	Communication modules shall be compatible for the two ports (one optical port for communication with meter reading instruments & the other hardwired RS 232 port to communicate with various modems for AMR)	**USA:** HP, Optonica, National Semiconductors, **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek Or any other reputed make
6	Optical port	Optical port shall be used to transfer the meter data to meter reading instrument. The mechanical construction of the port shall be such to facilitate the data transfer easily.	**USA:** HP, National Semiconductors, Maxim **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek Or any other reputed make

7	Power supply	The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	SMPS Type
8	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** National Semiconductors, Atmel, Philips, Texas Instruments, BC Component Analog devices, ST, Maxim, Siemens, PHYCOMP, YAGEO, DRALORIC, KOA, WELWYN, OSRAM, Kemet Onsemiconductors, Freescale, Intersil, Raltron, Fairchild, Muruta, Agilent, AVX, Abracon, Sipex, Diode Inc., Honeywell, Power Integration, Fox, Roham **Japan:** Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung, Panasonic **India:** Keltron, Incap, VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic components Pvt. Ltd., Cermet, CTR. **Korea:** Samsung **Germany:** Vishay,

			Epcos, Diotech, Kemet, Infineon **Taiwan:** Yageo. Or any other reputed make
9	Mechanical parts	(i) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. (ii) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
10	Battery	Chargeable/ Non chargeable maintenance free guaranteed life of 10 years.	**USA:** Maxell, Renata **Japan:** Panasonic, Sony, Mitsubishi, Sanyo **Germany:** Varta, Tedirum **France:** Saft **Korea:** Tekcell, Vitzrocell Or any other reputed make
11	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standards.	**USA:** Philips, Dallas Atmel, Motorola, Microchip, Epson, ST, Teridian **Japan:** NEC or Oki. Or any other reputed make
12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum	

		thickness 1.6 mm.	

ANNEXURE – III

MSEDCL DEFINED OBIS CODES FOR PARAMETERS NOT PRESENT IN IS 16444 Part-II

NO.	PARAMETERS	OBIS Code						Interface Class No./ Attribute
		A	B	C	D	E	F	
1.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)	1	0	5	8	1	255	3/2
2.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)	1	0	5	8	2	255	3/2
3.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)	1	0	5	8	3	255	3/2
4.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)	1	0	5	8	4	255	3/2
5.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)	1	0	8	8	1	255	3/2
6.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)	1	0	8	8	2	255	3/2
7.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)	1	0	8	8	3	255	3/2
8.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)	1	0	8	8	4	255	3/2

SCHEDULE 'A'

GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

ITEM NAME	**THREE PHASE FOUR WIRE CT / PT OPERATED 5 AMPS OR 1 AMPS FULLY STATIC 0.5 S ACCURACY CLASS SMART HT ENERGY METER AS PER IS 16444, PART-II**	
SR. NO.	**GTP PARAMETERS**	**GTP VALUES**
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TO BE FILLED BY MANUFACTURER
2.	MAKE AND TYPE OF METER	TO BE FILLED BY MANUFACTURER
3.	APPLICABLE STANDARD IS AS PER IS 16444 Part II:	YES
4.	METER BEARS ISI MARK	YES
5.	FREQUENCY	50 HZ ±5%
6.	ACCURACY CLASS OF METER	0.5S (FOR ACTIVE AND REACTIVE ENERGY)
7.	PT SECONDARY VOLTAGE	63.5 V PH-N
8.	RATED VOLTAGE	110 V PH-PH OR 3 X 63.5 V PH-N
9.	VOLTAGE RANGE	+15% TO – 30% OF RATED VOLTAGE
10.	BASIC CURRENT (IB) OF METER	1 AMP; 5 AMPS.
11.	MAXIMUM CONTINUOUS CURRENT (IMAX)	2 TIMES (200 %) OF IB.
12.	SHORT TIME OVER CURRENT	AS PER IS 16444 Part II
13.	STARTING CURRENT OF METER	0.1% OF IB.

14.	CT RATIO OF METER	1 / 1 AMPS; 5 / 5 AMPS
15.	POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT	AS PER IS 16444
16.	POWER CONSUMPTION IN EACH CURRENT CIRCUIT	AS PER IS 16444
17.	POWER FACTOR	ZERO LAG TO UNITY TO ZERO LEAD TO UNITY
18.	POWER SUPPLY IS SMPS & MICRO CONTROL TYPE	YES
19.	STANDARD REFERENCE TEMPERATURE OF METER	27^0 C
20.	MEAN TEMPERATURE CO-EFFICIENT	SHALL NOT EXCEED 0.03%.
21.	KVA MD PROVIDED	YES
22.	OPAQUE METER BASE & TRANSPARENT/OPAQUE TOP COVER IS MADE OUT OF, UNBREAKABLE, TOUGH, NON -BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE MATERIAL SO AS TO GIVE IT AND QUALITIES.	YES
23.	POLY CARBONATE BODY OF METER CONFORMS TO IS: 11731 (FV-2 CATEGORY)	YES
24.	POLY CARBONATE BODY MEETS TEST REQUIREMENT OF (a) HEAT DEFLECTION TEST AS PER ISO 75 > 115^0C	YES
25.	(b) GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 1984 OR IEC PUB 60695-2-12 AT 650^0C	YES
26.	(c) BALL PRESSURE TEST AS PER IEC--60695-10-2	YES
27.	(d) FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986	YES
28.	TYPE TEST REPORT NOS. & DATE OF ABOVE (A) TO (D)	TO BE FILLED BY MANUFACTURER

29.	PHYSICAL WATER ABSORPTION VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
30.	THERMAL HDDT VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
31.	TENSILE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
32.	FLEXURE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
33.	MODULUS OF ELASTICITY OF METER BODY	TO BE FILLED BY MANUFACTURER
34.	IZOD IMPACT STRENGTH OF METER BODY NOTCHED AT 23°C	TO BE FILLED BY MANUFACTURER
35.	POLY-CARBONATE OPAQUE BASE AND TRANSPARENT/OPAQUE TOP COVER IS ULTRA-SONICALLY/CHEMICAL WELDED (CONTINUOUS WELDING)	YES
36.	THICKNESS OF MATERIAL FOR METER COVER & BASE	2 MM MINIMUM
37.	METER BODY TYPE TESTED FOR IP51 DEGREE OF PROTECTION AS PER IS: 12063 AGAINST INGRESS OF DUST, MOISTURE & VERMIN.	YES
38.	IP51 DEGREE OF PROTECTION AS PER IS: 12063 TEST CERTIFICATE NO. & DATE	TO BE FILLED BY MANUFACTURER
39.	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS WITH TWO HOLES.	TO BE FILLED BY MANUFACTURER
40.	TERMINAL BLOCK IS MADE FROM HIGH QUALITY NON-HYGROSCOPIC, FIRE RETARDANT, REINFORCED POLYCARBONATE / NON-BAKELITE MATERIAL	YES
41.	MATERIAL OF WHICH THE TERMINAL BLOCK IS MADE IS CAPABLE OF PASSING THE TESTS GIVEN IN IS: 1336O (PART 6/SEC 17), ISO 75-1 (1993) &	YES

	ISO 75-2 (1993) FOR A TEMPERATURE OF 135^{0}C AND A PRESSURE OF 1.8 MPA (METHOD A)	
42.	TYPE TEST REPORT NOS. & DATE OF ABOVE	YES
43.	TWO SCREWS ARE PROVIDED IN EACH CURRENT & POTENTIAL TERMINAL FOR EFFECTIVELY CLAMPING THE EXTERNAL LEADS OR THIMBLES IN TERMINAL BLOCK	YES
44.	MINIMUM INTERNAL DIAMETER OF TERMINAL HOLE	TO BE FILLED BY MANUFACTURER
45.	TERMINATION ARRANGEMENT IS PROVIDED WITH AN EXTENDED TRANSPARENT TERMINAL COVER AS PER IS: 16444 Part II /2017 (AMENDED UPTO DATE) IRRESPECTIVE OF REAR CONNECTIONS	YES
46.	TERMINAL COVER IS UNBREAKABLE, TOUGH, NON -BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE & IS MADE OF THE SAME MATERIAL AS THAT OF METER BODY	YES
47.	TERMINAL COVER IS TRANSPARENT	YES
48.	TERMINAL COVER ENCLOSES ACTUAL TERMINALS, CONDUCTOR FIXING SCREWS AND A SUITABLE LENGTH OF EXTERNAL CONDUCTORS AND THEIR INSULATION	YES
49.	TERMINAL COVER IS PROVIDED WITH ONE SIDE HINGE/TWO TOP HINGES	YES
50.	INDEPENDENT SEALING PROVISION IS MADE AGAINST OPENING OF THE TERMINAL COVER AND FRONT COVER TO PREVENT UNAUTHORIZED TAMPERING	YES
51.	BIDIRECTIONAL SCREWS WITH TWO HOLES FOR SEALING PURPOSE OF TERMINALCOVER ARE PROVIDED	YES
52.	FIXING SCREWS USED ON THE TERMINAL COVER FOR FIXING AND SEALING ARE HELD CAPTIVE IN THE TERMINAL COVER	YES

53.	PROPER SIZE OF GROOVES/U-CUT PROVIDED AT BOTTOM OF TERMINAL COVER FOR INCOMING SERVICE CONNECTIONS	YES
54.	PUSH BUTTONS ARE PROVIDED AS PER SPECIFICATION	YES
55.	PROVISION FOR AT LEAST TWO SEALS TO BE PUT BY UTILITY USER	YES
56.	PROVISION OF DISPLAY OF HIGH RESOLUTION READING / ALTERNATE MODE	YES
57.	OUTPUT DEVICE FOR TESTING OF METER IN THE FORM OF BLINKING LED WITH CONSTANT PULSE RATE IS PROVIDED	YES
58.	RESOLUTION OF THE TEST OUTPUT DEVICE IS SUFFICIENT TO ENABLE THE STARTING CURRENT TEST IN LESS THAN 10 MINUTES	YES
59.	PULSE RATE OF OUTPUT DEVICE IS PROGRAMMED ACCORDING TO PRIMARY VALUES OF VOLTAGE & CURRENT & IS PROVIDED ON NAMEPLATE	YES
60.	METER CONSTANT IS INDELIBLY PRINTED ON THE NAME PLATE OF THE METER	YES
61.	METER ACCURACY NOT AFFECTED BY AC / DC MAGNETIC FIELD AS IS 16444 Part II	YES
62.	THE METER ACCURACY SHALL NOT BE AFFECTED BY EXTERNAL AC / DC / PERMANENT MAGNETIC FIELD AS PER CBIP TECHNICAL REPORT 325 WITH LATEST AMENDMENTS. IF THE METER GETS AFFECTED UNDER INFLUENCE OF ANY MAGNETIC FIELD (AC / DC / PERMANENT), THEN THE SAME SHALL BE RECORDED AS MAGNETIC TAMPER EVENT WITH DATE & TIME STAMPING AND THE METER SHALL RECORD ENERGY MAXIMUM VALUE CURRENT (IMAX) AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	YES
63.	METER IS CAPABLE TO WITHSTAND AND NOT GET	YES

	DAMAGED IF PHASE TO PHASE VOLTAGE IS APPLIED BETWEEN PHASES & NEUTRAL FOR FIVE MINUTES	
64.	POWER SUPPLY UNIT IS MICRO CONTROL TYPE (SMPS)	YES
65.	NON SPECIFIED DISPLAY PARAMETERS IN ARE BLOCKED AND NOT ACCESSIBLE FOR REPROGRAMMING AT SITE	YES
66.	CTS ARE PROVIDED WITH MAGNETIC SHIELDING AND ARE TESTED SEPARATELY PRIOR TO ASSEMBLY	YES
67.	COMPLETE METERING SYSTEM DOES NOT AFFECTED BY EXTERNAL ELECTROMAFNETIC INTERFERRENCE	YES
68.	REAL TIME QUARTZ CLOCK IS USED IN METER FOR MAINTAINING TIME (IST) AND CALENDAR	YES
69.	RTC BATTERY IS NON – RECHARGEABLE TYPE	YES
70.	RTC PRE - PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR CORRECTION	YES
71.	MAXIMUM DRIFT TIME OF RTC PER YEAR	SHALL NOT EXCEED +/- 300 SECONDS PER YEAR
72.	DAY / DATE SETTING & SYNCHRONISATION POSSIBLE THROUGH PASSWORD / KEY CODE	YES
73.	RTC BATTERY & BATTERY FOR DISPLAY ARE SEPARATE	YES
74.	METER WITHSTANDS HIGH VOLTAGE & HIGH FREQUENCY SURGES WHICH ARE SIMILAR TO THE SURGES PRODUCED BY INDUCTION COIL TYPE INSTRUMENTS WITHOUT AFFECTING THE ACCURACY OF THE METER	YES
75.	ACCURACY OF METER IS NOT AFFECTED WITH	YES

	APPLICATION OF ABNORMAL VOLTAGE / FREQUENCY GENERATING DEVICE SUCH AS SPARK DISCHARGE OF APPROXIMATELY 35 KV	
76.	SPARK DISCHARGE OF APPROXIMATELY 35 KV CARRIED OUT	YES
77.	METER LOGS UNSATISFACTORY OR NON FUNCTIONING OF RTC BATTERY	YES
78.	METERING PROTOCOL AS PER ANNEX E - CATEGORY C1 METERS OF IS 16444 Part II	YES
79.	COMMUNICATION MODULE & OPTICAL PORT FOR COMMUNICATION AND WITH SEALING ARRANGEMENT ARE PROVIDED	YES
80.	DEFAULT & MINIMUM BAUD RATE OF OPTICAL PORTS IS 9600 BPS	YES
81.	INTERNAL NI-MH OR LI-ION OR NI CD MAINTENANCE FREE BATTERY OF LONG LIFE OF 10 YEARS WITH PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY	YES
82.	METER PCB IS WIRE LESS & IS MADE BY SURFACE MOUNTING TECHNOLOGY	YES
83.	METER RECORDS & DISPLAY TOTAL ENERGY INCLUDING HARMONIC ENERGY	YES
84.	NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED	YES
85.	6 (SIX) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED	YES
86.	PROVISION FOR MD INTEGRATION PERIOD OF 15 MINUTE IS MADE	YES
87.	PROVISION THROUGH COMMUNICATION DRIVEN RESET OF MD IS PROVIDED	YES
88.	PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED	YES

89.	PROVISION FOR AUTO RESET OF MD AT CERTAIN PREDEFINED PERIOD IS PROVIDED	YES
90.	ALL ANTI TAMPER FEATURES ARE INCORPORATED IN METER AS PER SPECIFICATION	YES
91.	METER LOGS TAMPER EVENTS AS PER SPECIFICATION	YES
92.	TAMPER NO. & TAMPER EVENT IS REGISTERED IN TAMPER EVENT REGISTER	YES
93.	THE NO. OF TIMES THE TAMPERING HAS BEEN DONE IS ALSO REGISTERED IN THE METER	YES
94.	METER KEEPS RECORD OF TAMPER EVENTS FOR MINIMUM 200 EVENTS ON FIFO BASIS	YES
95.	SUPPLY INDICATION IN THE FORM OF LED / LCD DISPLY IS PROVIDED	YES
96.	SUPPLY INDICATION IS VISIBLE FROM THE FRONT OF THE METER	YES
97.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF MINIMUM 6 DIGITS AND MINIMUM 8 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED	YES
98.	SIZE OF DIGITS	MINIMUM 8X5 MM
99.	AUTO DISPLAY CYCLING PUSH BUTTON WITH PERSISTENCE TIME OF 10 SECONDS IS PROVIDED	YES
100.	PUSH BUTTON FOR HIGH RESOLUTION DISPLAY / ALTERNATE MODE OF DISPLAY IS PROVIDED	YES
101.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF 70^0C	YES
102.	METER IS PROGRAMMED FOR (A) MD INTEGRATION PERIOD OF 15 MINUTES	YES

103.	(B) AVERAGE POWER FACTOR WITH 2 DECIMAL DIGITS	YES
104.	(C) AUTO RESET KVAMD AT 24.00 HRS. OF LAST DAY OF THE MONTH AS PER CLAUSE 10.00 (III) OF SPECIFICATION	YES
105.	(D) ARRAY OF DATA TO BE RETAINED INSIDE THE METER MEMORY FOR THE LAST 32 DAYS FOR A CAPTURE PERIOD OF 15 MINUTES ON FIRST IN FIRST OUT BASIS (FIFO)	YES
106.	SEQUENCE OF DISPLAY PARAMETERS IS AS PER SPECIFICATIONS	YES
107.	METER RECORDS & DISPLAYS THE QUANTITES AS PER SPECIFICATION	YES
108.	DISPLAY OTHER THAN SPECIFIED IS BLOCKED	YES
109.	OTHER KVA MD VALUES ARE AVAILABLE IN RESET BACKUP DATA FOR 12 MONTHS.	YES
110.	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF 'PUSH BUTTON' IS NOT OPERATED FOR 15 SECONDS	YES
111.	BILLING DATA IS AS PER SPECIFICATION	YES
112.	PROVISION FOR RECORDING HISTORY OF BILLING PARAMETERS FOR LAST 12 MONTHS	YES
113.	PROVISION FOR LOAD SURVEY DATA FOR EVERY 15 MINUTES AND FOR PREVIOUS 32 DAYS FOR SPECIFIED PARAMETERS ON FIFO BASIS	YES
114.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 12 OF IS 15959 Part 3: & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
115.	A DLMS COMPLIANT HHU IS PROVIDED	YES
116.	PROVISION FOR AUTO POWER SAVE IS MADE ON HHU	YES

117.	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY	YES
118.	LICENSED COPIES OF BASE COMPUTER SOFTWARE ARE SUPPLIED FREE OF COST.	YES
119.	NO EDITING IN TRANSFERRED DATA IS POSSIBLE ON BASE COMPUTER AS WELL AS HHU BY ANY MEANS .	YES
120.	DOWNLOADING SOFTWARE IS SUBMITTED TO INSTALL ON OUR LAPTOP / PC FOR DIRECTLY DOWNLOADING DATA FROM METER WITHOUT THE USE OF HHU	YES
121.	SOFTWARE PROVIDED ON LAPTOP/PC IS COMPATIBLE TO READ DATA FROM USB DRIVE	YES
122.	CABLE WITH USB TERMINATION PROVIDED	YES
123.	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 32 DAYS	LESS THAN OR EQUAL TO 9 MINUTES
124.	DOWNLOADING TIME OF ONLY BILLING DATA	LESS THAN OR EQUAL TO 20 SECS
125.	PERMANENT NATURE CONNECTION DIAGRAM OF METER IS SHOWN ON INSIDE PORTION OF THE TERMINAL COVER	YES
126.	DISTINCTLY MARKED NAME PLATE WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS, CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL IS PROVIDED ON METER	YES
127.	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER	YES
128.	CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL	YES

	PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE IS PROVIDED ON METER	
129.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 12 OF IS 15959 Part 3: & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
130.	CATEGORY OF METER AS "CATEGORY D3 – HT (PT / CT) CONSUMER METER" IN 3 MM BOLD FONT IS MARKED ON NAME PLATE	YES
131.	WHETHER METER IS TYPE TESTED	YES
132.	TYPE TEST REPORT NOS. & DATE OF METER	TO BE FILLED BY MANUFACTURER
133.	METER PROTOCOL REPORT NOS. & DATES	TO BE FILLED BY MANUFACTURER
134.	ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS 16444 Part II. AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY	TO BE FILLED BY MANUFACTURER
135.	TRANSPORTATION TEST IS CARRIED OUT	YES
136.	METERS ARE GUARANTEED AS PER TENDER DOCUMENT	YES
137.	GUARANTEE TO REPLACE METERS FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES
138.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	YES
139.	IN HOUSE TESTING FACILITY IS AVAILABLE FOR (A) AC VOLTAGE TEST	YES

140.	(b) INSULATION RESISTANCE TEST	YES
141.	(c) ACCURACY REQUIREMENT	YES
142.	(d) TEST ON LIMITS OF ERRORS	YES
143.	(e) TEST ON METER CONSTANT	YES
144.	(f) TEST OF STARTING CONDITION	YES
145.	(g) TEST OF NO-LOAD CONDITION	YES
146.	(h) REPEATABILITY OF ERROR TEST	YES
147.	(i) TEST OF POWER CONSUMPTION	YES
148.	(j) TAMPER CONDITIONS AS PER MSEDCL SPECIFICATION	YES
149.	(k) GLOW WIRE TEST	YES
150.	(l) LONG DURATION TEST	YES
151.	(m) FLAMABILITY TEST	YES
152.	(n) MANUFACTURER HAVE DULY CALIBRATED RSS METER OF CLASS 0.01 ACCURACY	YES
153.	NO. OF SAMPLE METERS AS PER TENDER DOCUMENT & TECHNICAL SPECIFICATIONS ARE SUBMITTED ALONG WITH OFFER	YES
154.	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	YES
155.	AGEING TEST FOR 72 HOURS AT 55^0 C TEMPERATURE AND ATMOSPHERIC HUMIDITY UNDER REAL LIFE CONDITION AT FULL LOAD CURRENT TO ELIMINATE INFANT MORTALITY IS CARRIED OUT	YES
156.	GUARANTEE TO REPLACE METERS FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES

157.	QUALITY ASSURANCE PLAN AS PER SPECIFICATIONS IS ENCLOSED	TO BE FILLED BY MANUFACTURER
158.	COMPONENT SPECIFICATION AS PER SPECIFICATION	YES

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

THREE PHASE FOUR WIRE CT / PT OPERATED 0.2 S CLASS, 1 AMP OR 5 AMPS TRI VECTOR SMART ENERGY METER WITH BUILT IN COMMUNICATION MODULE AS PER IS 16444 PART -II

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1.00 SCOPE

This specification covers design; manufacture, testing, supply and delivery of ISI mark HT three phase four wire CT / PT operated 1 Amps or 5 Amps 0.2S fully Static & AMR compatible TOD Tri - vector Energy Meter with bi directional integrated communication capability as per parameters defined in the standard IS-16444-Part II. The meter should be configurable in field through secured transaction as defined in IS-16444 Part II. The bidirectional communication module should be integral part of meter with suitable sealing arrangement. The meters shall be suitable for measurement of Active Energy (kWh), Reactive Energy (kVArh) Lag and (kVArh) Lead separately, Apparent Energy (kVAh), demand (kW), demand (kVA), etc. as per Power tariff requirement for AC balanced / unbalanced loads of HT Consumers.

The meter shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 APPLICATION

For use on HT consumer installations.

3.00 SERVICE CONDITIONS

As per IS: 16444:2017 (amended up to date), the meter must perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS). The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Environmental Conditions

(a) Maximum ambient temperature	55^0 C
(b) Maximum ambient temperature in shade	50^0 C
(c) Minimum temperature of air in shade	5^0 C
(d) Maximum daily average temperature	40^0 C

(e) Maximum yearly weighted average temperature 32^0 C

(f) Relative Humidity 10 to 95 %

(g) Maximum Annual rainfall 1450 mm

(h) Maximum wind pressure 150 Kg/m^2

(i) Maximum altitude above mean sea level 1000 mtrs

(j) Isoceraunic level 50 days/year

(k) Seismic level (Horizontal acceleration) 0.3 g

(l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

4.00 STANDARD TO WHICH METER SHALL COMPLY

IS 16444 Part-II- A.C. Static Transformer Operated Watt hour and Var-Hour Smart Meters, Class 0.2s, 0.5s and 1.0s Part 2 Specification Transformer Operated Smart Meter.

IEC 62052 -11, IEC 62053-21 (ACTIVE ENERGY) & IEC 62053-24 (REACTIVE ENERGY).

CEA metering regulations 2022 for AMR metering.

5.00 GENERAL TECHNICAL REQUIREMENT

1)	TYPE	Three Phase, Four Wire 1 Amp or 5 Amps fully Static AMR compatible TOD Tri - Vector Smart Energy Meter with Optical & inbuilt communication module as per Category D3 of IS: 15959 / 2011 PART 3/2017 (with DLMS protocol) for use on HT Consumers installation.
2)	FREQUENCY	50 Hz ±5%
3)	ACCURACY CLASS	0.2S (FOR ACTIVE AND REACTIVE ENERGY)
4)	PT SECONDARY VOLTAGE	63.5 V Ph-N
5)	RATED VOLTAGE	110 V Ph-Ph or 3 x 63.5 V Ph-N

6)	VOLTAGE RANGE	+15% to – 30% of rated voltage.
7)	PT RATIO	$\frac{11}{\sqrt{3}}$ kV/$\frac{110}{\sqrt{3}}$ V
8)	CT RATIO	1 / 1 Amps; 5 / 5 Amps
9)	BASIC CURRENT (I_b)	1 Amp; 5 Amps.
10)	MAXIMUM CONTINUOUS CURRENT (I_{max})	2 times (200 %) of Ib.
11)	SHORT TIME CURRENT	As per IS 16444 Part –II, 2017
12)	STARTING CURRENT	0.1% of Ib.
13)	POWER CONSUMPTION	The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 5.0 W and 15 VA during idle mode of communication module. The additional power requirement during data transmission shall not exceed 7 watt per communication module. The apparent power taken by each current circuit, at basic current Ib, reference frequency and reference temperature shall not exceed 2 VA.
14)	POWER FACTOR	Power Factor range: Zero Lag to unity to Zero Lead to unity Avg. P.F = $\frac{\text{Total(kWh)}}{\text{Total (kVAh)}}$ $kVAh = \sqrt{(Kwh)^2 + (RKVAhlag + RKVAhlead)^2}$
15)	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving parts;

		electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.1 class) software based test bench.
16)	POWER SUPPLY	SMPS
17)	ISI MARK	The meter shall bear ISI Mark
18)	TEMPERATURE	The standard reference temperature for performance shall be 27^0 C. The mean temperature co-efficient shall not exceed 0.03%.

6.00 CONSTRUCTIONAL REQUIREMENT

6.01 GENERAL MECHANICAL REQUIREMENT

The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

(a) personal safety against electric shock:

(b) personal safety against effects of excessive temperature;

(c) safety against spread of fire;

(d) Protection against penetration of solid objects, dust and water.

(e) Detection of fraud / pilferage

6.02 The meter shall be projection type and shall be dust and moisture proof. All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

6.03 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non ageing and of tested quality.

6.04 METER CASE

6.04.01 The meter base & cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The construction of the meter shall be such that it can be sealed independently and the cover cannot be removed without breaking the seal. Meter base shall be opaque and meter top cover shall be transparent/opaque

6.04.02 The poly carbonate body of the meter shall conform to IS: 11731 / 1986 (FV-2 Category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 2008 OR IEC PUB 60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2) 1986.

6.04.03 The Poly-carbonate opaque base and transparent/ Opaque cover of meter shall be ultra-sonically welded (continuous welding) or meter case and cover shall have break to open functionality with clear physical evidence on forcibly opening of cover. So that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).

6.04.04 The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust, moisture & vermin. The type test certificate shall be submitted along with the offer.

6.04.05 The meter cover shall be secured to base by means of sealable unidirectional/bidirectional captive screws with two holes.

6.05 TERMINALS & TERMINAL BLOCK

6.05.01 The terminal block shall be made from high quality non-hygroscopic, fire retardant, reinforced polycarbonate / non-Bakelite material which shall form an extension of the meter case.

6.05.02 The material of which the terminal block is made shall be capable of passing the tests given in IS: 1336O (Part 6/Sec 17), ISO 75-1 (1993) & ISO 75-2 (1993) for a temperature of 135^0C and a pressure of 1.8 MPa (Method A).

6.05.03 The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

6.05.04 The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

6.05.05 Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of meter shall screw into metal nuts.

6.05.06 All parts of every terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

6.05.07 Electrical connections shall be so designed that contact pressure is not transmitted through insulating material of the terminal block.

6.05.08 The terminals, the conductor fixing screws or the external or internal conductors shall not be liable to come into contact with terminal covers.

6.05.09 Two screws shall be provided in each current & potential terminal for effectively clamping the external leads or thimbles.

6.05.10 Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall be such as not to pierce and cut the conductors used.

6.05.11 The minimum internal diameter of terminal hole shall be as per IS 16444 Part II::2017

6.05.12 The manufacturer shall ensure that the supporting webs between two terminals of the terminal block shall be sufficiently high to ensure that two neighboring terminals do not get bridged by dust and there shall not be any possibility of flash over between adjacent terminals of the terminal block. Overall the quality of the meter should be good and the service life of the meter shall be 10 years.

6.06 TERMINAL COVER

6.06.01 The termination arrangement shall be provided with an extended transparent terminal cover as per IS 16444 Part II.

6.06.02 The terminal cover shall be made out of same material as that of meter body. The terminal cover shall be unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The terminal cover shall be transparent.

6.06.03 The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

6.06.04 The terminal cover shall be provided with one side hinge/two top hinges.

6.06.05 Independent sealing provision shall be made against opening of the terminal cover and meter body cover to prevent unauthorized tampering. It is necessary to provide bidirectional screws with two holes for sealing purpose of terminal cover. The meter shall be pilfer-proof & tamper-proof.

6.06.06 The fixing screws used on the terminal cover for fixing and sealing in terminal cover shall be held captive in the terminal cover.

6.06.07 Proper size of grooves/U-Cut shall be provided at bottom of this terminal cover for incoO.ming service connections.

6.06.08 When the meter is mounted, no access to the terminals by any means shall be possible without breaking seals(s) of the terminal cover.

6.07 RESISTANCE TO HEAT AND FIRE

The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

6.08 The meter shall be completely factory sealed except the terminal block cover.

6.09 The provision shall be made on the meter for at least two seals to be put by utility user.

6.10 A Push button facility shall be provided for high resolution reading / alternate mode of display, as brought out elsewhere in this specification. Facility of scrolling of all the readings up and down in all the display modes shall be provided.

6.11 OUTPUT DEVICES

The meter shall have test output accessible from the front and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from front. The test output device shall be provided in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. The pulse rate of output device which is Pulse / kWh and Pulse / kVArh (meter constant) shall be programmed according to primary values of voltage & current & shall be indelibly provided on the nameplate.

6.12 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per IS 16444 Part-II, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

6.13 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases & neutral for five minutes without affecting the accuracy.

6.14 In meter, power supply unit shall be micro control type instead of providing transformer and then conversion to avoid magnetic influence.

6.15 Non specified display parameters in the meter shall be blocked and it shall not be accessible for reprogramming at site. However these

parameters shall be programmable at site through representative of meter manufacturer.

6.16 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc.

6.17 Internal CTs if used are to be provided with magnetic shielding and they shall be tested separately prior to assembly by the meter manufacturer.

6.18 PCB used in meter shall be made by Surface Mounting Technology.

6.19 REAL TIME INTERNAL CLOCK (RTC)

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 seconds per year.

The clock day / date setting and synchronization shall only be possible through password / Key code command from one of the following:

a) Hand Held Unit (HHU), Laptop Computer or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger 'PC'.

The RTC battery & the battery for display in case of power failure shall be separate.

6.20 The meter shall remain immune for the test of electromagnetic HF/RF defined under the test IS 16444 Part II: 2017 amended up to date.

6.21 The communication of energy meters shall not be affected considering the above feature.

6.22 The meter shall withstand any type of High Voltage and High Frequency surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter.

The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 kV.

The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(i) On any of the phases or neutral terminals

(ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(iii)At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device.

6.23 SELF DIAGNOSTIC FEATURES

6.23.01 The meter shall keep log in its memory for unsatisfactory functioning or non-functioning of Real Time Clock battery or low battery indication on display, also it shall be recorded and indicated in reading file at base computer software.

6.23.02 All display segments: "LCD Test" display shall be provided for this purpose.

6.24 The watch dog provided shall invariably protect the hanging of microprocessor during such type of tampering devices.

6.25 METER PROTOCOL

The meter protocol shall be as per IS 16444 Part II: 2017 amended up to date.

6.26 COMMUNICATION CAPABILITY

7.00 The meter shall be provided with two ports for communication of the measured / collected data as per IS 16444 Part II:2017, i.e inbuilt Communication Module (4G/2G/3G/NB-IoT/PLCC/LPRF) and an Optical port complying with hardware specifications detailed in IEC 1107 – or 62056 - 21. This shall be used for local data downloading through a DLMS compliant HHU, Mobile Application. Sealing arrangement for Optical & Communication Module as required shall be provided.

During data communication process through either AMR or MRI, the meter energy recording should not get affected.

Optical Port shall support the default and minimum baud rate of 9600 bps.

Communication Module: - The smart Meter shall have bidirectional communication module which shall integrate with meter. The communication module shall accommodate 4G/2G/3G/NB-IoT/PLCC/LPRF for bidirectional communication with HES. Meter shall be capable to record the communication module removal as an event.

7.01 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal battery may be provided.

The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided.

Non rechargeable Battery (Primary battery) shall also be accepted with battery life of minimum 15 years.

7.02 WIRE / CABLE LESS DESIGN

The meter PCB shall be wireless to avoid improper and loose connections/ contacts.

7.03 Meter shall record & display total energy including Harmonic energy.

7.04 Reverse reading lock of main KWh and kVAh reading is to be incorporated with necessary software modification if required additionally.

7.05 The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

8.00 TOD TIMINGS

There shall be provision for at least 6 (SIX) TOD time zones for energy and demand. The number and timings of these TOD time zones shall be programmable by manufacturer both at site / factory.

At present the time zones shall be programmed as below:

ZONE “A” (TZ1): 0000 Hrs to 0600 Hrs and 2200 Hrs to 2400 Hrs.

ZONE “B” (TZ2): 0600 Hrs to 0900 Hrs and 1200 Hrs to 1800 Hrs.

ZONE “C” (TZ3): 0900 Hrs to 1200 Hrs.

ZONE “D” (TZ4): 1800 Hrs to 2200 Hrs.

9.00 DEMAND INTEGRATION PERIOD

The maximum demand integration period shall be set at 15 minutes with block window method.

10.00MD RESET

The meter shall have following MD resetting options.

i) Communication driven reset;

ii) Manual resetting arrangement with sealing facility;

iii) Automatic reset on First day of every month at 00.00 Hrs. This option shall be blocked by default and made programmable through hand held terminal / CMRI for the actual date required.

11.00 TAMPER AND FRAUD MONITORING FEATURES

11.01 ANTI TAMPER FEATURES.

The meter shall detect and correctly register energy under following tamper conditions:

(a) The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(b) The meter shall continue to work even without neutral as per prevailing electrical conditions.

(c) The meter shall work in absence of any two phases i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(d) The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per IS 16444 Part II: then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

(e) If a consumer tries to steal power by disconnecting the voltage supply of one or two phases of the meter externally or by tampering so that no voltage or partial voltage (< 50% of Vref) is available to voltage circuit of meter & current is flowing in that phase, the meter shall record energy (kVAh & kWh) at Vref, current available in these phases & unity power factor.

(f) The meter shall remain immune for the test of electromagnetic HF/RF IS 16444 Part II:

TAMPER EVENTS

11.01.01 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS.

11.01.02 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh power factor, event code, date & time etc. listed in IS 16444 Part II:

11.01.03 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping as per IS 16444 Part II: and the meter shall continuously display that the cover has been tampered.

11.01.04 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter.

11.01.05 Tamper details shall be retrieved by authorized personnel through either of the following:

i) HHU.

ii) Remote access through suitable communication network.

11.01.06 Minimum 200 numbers of events (occurrences & restoration with date & time) shall be available in the meter memory. The recording of abnormal events shall be on FIFO basis as per IS 16444 Part II: The unrestored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months).

All the information of data shall be made available in simple & easy to understand format.

11.02 The threshold values for various tampers are as below.

Sr. No.	**Description**	**Occurrence (With Occ. Time 5 min.)**	**Restoration (With Rest. Time 5 min.)**
1.	PT link Missing (Missing potential)	< 50% of Vref and current in that phase is > 1% Ib	> 50 % of Vref
2.	Over voltage in any phase	> 115 % of Vref	< 115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance	Vmax - Vmin > 10 % Vmax	Vmax - Vmin < 10 % Vmax

	5.	CT reverse	Change in direction of current	Current flow in forward direction.
	6.	CT Open.	Zero Amps in one or two phases and current in at least 1 phase is > 5% Ib for 15 minutes.	> 3 % Ib for 15 min in the tampered phase for 15 min.
	7.	Current Unbalance. (Diff. of phase currents)	> 30 % Iref* for 15 min	< 30 % Iref* for 15 min
	8.	Current Bypass	Bypass Current > 50 % Iref* for 15 min	Bypass Current < 30 % Iref* for 15 min
	9.	Over Current in any Phase	> 120 % I_b	< 120 % I_b
	10.	Influence of permanent magnet or AC / DC electromagnet / permanent magnet	Immediate	1 minute after removal
	11.	Neutral Disturbance	--	--
	12.	Power failure	Immediate	Immediate
	13.	Very Low PF	--	--
	14.	Meter Cover Opening	(2 to 4 mm) Immediate (Occurance only)	
	*	Higher of 3 phase currents shall be taken as reference for this purpose.		

12.00 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc as per details given in the table No 1 of IS: 15959 / Part -3/2017.

b) Block Load Profile Parameters such as kVAh, kWh, kVArh (lag), kVArh (lead), Maximum Demand (MD) in kW / kVA / power factor / phase and line voltages / currents etc. as per details given in Table 2 of IS 15959 Part-3/2017.

c) Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh, etc. as per details given in Table 4 of IS 15959 Part-3/2017.

13.00 DISPLAY OF MEASURED VALUES

13.01 DISPLAY INDICATORS

The supply indication shall be displayed permanently by LCD as a minimum and shall be visible from the front of the meter. In case of non available of voltage to any phase(s), the LCDs of that particular phase shall stop glowing or those particular indicator(s) shall start blinking on the LCD display of meter.

13.02 Permanently backlit LCD panel shall show the relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years.

The meter shall have minimum 6 digits (with +/- indication), parameter identifier, permanently backlit Liquid Crystal Display (LCD) with wide viewing angle. The size of digit shall be minimum 8x5 mm. The decimal units shall not be displayed in auto scroll mode. However it shall be displayed in push button mode or alternate mode for high resolution display for testing. Auto display cycling push button is required with persistence time of 10 Seconds. LCD shall be suitable for temperature withstand of 70^0 C; adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

13.03 The meters shall be pre-programmed for following details.

a) PT Ratio: $\frac{11}{\sqrt{3}}$kV/$\frac{110}{\sqrt{3}}$V

b) CT Ratio: 1/1 Amps or 5/5 Amps as per requirement.

c) MD resetting shall be auto as per clause no. 9.00 (iii).

d) MD Integration Period is 15 Minutes real time based.

e) Average power factor with 3 decimal digits shall be displayed.

f) The array of data to be retained inside the meter memory shall be for the last 32 days for a capture period of 15 minutes. Load survey data shall be first in first out basis (FIFO).

g) The display of various parameters in Normal Mode & Alternate mode shall be as per IS 16444 Part II:

SN	PARAMETERS
A	**NORMAL DISPLAY (DEFAULT DISPLAY)**
1.	LCD Test
2.	Real Time Clock – Date & Time
3.	Voltage – V_R
4.	Voltage – V_Y
5.	Voltage – V_B
6.	Current – I_R
7.	Current – I_Y
8.	Current – I_B
9.	Cumulative Energy – kWh
10.	Cumulative Energy – kWh - TOD Zone A (TZ1)
11.	Cumulative Energy – kWh - TOD Zone B (TZ2)
12.	Cumulative Energy – kWh - TOD Zone C (TZ3)
13.	Cumulative Energy – kWh - TOD Zone D (TZ4)
14.	Cumulative Energy – kVArh - Lag
15.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
16.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
17.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
18.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)

19.	Cumulative Energy –kVArh - Lead
20.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
21.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
22.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
23.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)
24.	Cumulative Energy – kVAh
25.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
26.	Cumulative Energy – kVAh - TOD Zone B (TZ2)
27.	Cumulative Energy – kVAh - TOD Zone C (TZ3)
28.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
29.	Current MD – kVA with occurance date & time
30.	MD - kVA – TOD Zone A (TZ1) with occurance date & time
31.	MD - kVA – TOD Zone B (TZ2) with occurance date & time
32.	MD - kVA – TOD Zone C (TZ3) with occurance date & time
33.	MD - kVA – TOD Zone D (TZ4) with occurance date & time
34.	Number of MD – kVA reset
35.	Rising MD with elapsed time
36.	Three Phase Power Factor – PF
37.	Cumulative Tamper Count
38.	Meter Cover Opening – Occurance with date and time.
B	**ON DEMAND DISPLAY (ALTERNATE MODE)**
1.	Last date & time of MD - kVA reset
2.	Current – I_R

3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_R
6.	Voltage – V_Y
7.	Voltage – V_B
8.	Signed Power Factor – R Phase
9.	Signed Power Factor – Y Phase
10.	Signed Power Factor – B Phase
11.	Frequency
12.	High resolution kWh (for calibration)
13.	High resolution kVArh Lag(for calibration)
14.	High resolution kVArh Lead(for calibration)
15.	High resolution kVAh (for calibration)
16.	Running Demand kVA (for calibration)
17.	M1 MD - kVA – TOD Zone A (TZ1) with occurance date & time
18.	M1 MD - kVA – TOD Zone B (TZ2) with occurance date & time
19.	M1 MD - kVA – TOD Zone C (TZ3) with occurance date & time
20.	M1 MD - kVA – TOD Zone D (TZ4) with occurance date & time
21.	M2 MD - kVA – TOD Zone A (TZ1) with occurance date & time
22.	M2 MD - kVA – TOD Zone B (TZ2) with occurance date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurance date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurance date & time
25.	Last Tamper Event with date and time.

h) Oth

er KVA MD values shall be available in reset backup data for 12 months.

i) The meter display shall return to Default Display mode (mentioned above) if the 'Push button' is not operated for 15 seconds.

14.00 BILLING DATA, BILLING HISTORY & BLOCK LOAD SURVEY

14.01 BILLING DATA

The billing data shall be as per table 4 of IS 15959 Part-3 for Category D3:

Sr. No.	Parameters
1.	Billing Date
2.	System Power Factor for Billing Period
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh – Lag
9.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
10.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
11.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
12.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)
13.	Cumulative Energy – kVArh – Lead
14.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
15.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
16.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
17.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)

18.	Cumulative Energy – kVAh
19.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
20.	Cumulative Energy – kVAh – TOD Zone B (TZ2)
21.	Cumulative Energy – kVAh – TOD Zone C (TZ3)
22.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
23.	MD – kVA with occurance date & time
24.	MD – kVA – TOD Zone A (TZ1) with occurance date & time
25.	MD – kVA – TOD Zone B (TZ2) with occurance date & time
26.	MD – kVA – TOD Zone C (TZ3) with occurance date & time
27.	MD – kVA – TOD Zone D (TZ4) with occurance date & time
28.	MD – kW occurance date & time
29.	MD – kW – TOD Zone A (TZ1) with occurance date & time
30.	MD – kW – TOD Zone B (TZ2) with occurance date & time
31.	MD – kW – TOD Zone C (TZ3) with occurance date & time
32.	MD – kW – TOD Zone D (TZ4) with occurance date & time

14.02 BILLING HISTORY

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 12 months.

14.03 BLOCK LOAD SURVEY

The Block 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, however if there is no power for few block within one day those block should be displayed with 0 values with marking of power fail indication for that block i.e. for every day when there was power on, the meter must record 48 blocks. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. This 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 (XML) format.

The Block Load survey data shall be for specified parameters as per Table No 2 of IS 15959 Part 3: The specified parameters are as below.

Sr. No.	**Parameters**
1.	Real Time Clock – Date and Time
2.	Current - I_R
3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_{RN}
6.	Voltage – V_{YN}
7.	Voltage – V_{BN}
8.	Block Energy – kWh
9.	Block Energy – kVArh – Lag
10.	Block Energy – kVArh – Lead
11.	Block Energy – kVAh

15.00 DEMONSTRATION

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

16.00 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS 16444 Part II: The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS 16444 Part II:

COMPUTER SOFTWARE

16.01 For efficient and speedy recovery of data downloaded through HHU on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places

up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier.

16.02 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall be suitable for all types of printers such as dot matrix, inkjet, deskjet and laser printers.

16.03 The Base Computer Software shall be "Windows" based & user friendly.The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as HHU by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS.

16.04 The Base Computer Software should be password protected.

16.05 The total time taken for downloading Billing, Tamper and Load Survey Data for 32 days shall be less than or equal to 9 minutes.

16.06 Downloading time of only Billing data shall be less than or equal to 20 secs.

16.07 The BCS software shall create one single file for the uploaded data, e.g. if CMRI contains the meter readings of, say, 2,000 consumer meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading in ASCII format or XML file as per MIOS for individual meter reading.

16.08 Also there shall be a provision to give filenames while creating the file.

16.09 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3

16.10 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

16.11 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHU.

16.12 The software provided on laptop or PC shall be compatible to read the data from USB drive and for that purpose a cable (1 No.) shall be provided with USB termination. USB being the de-facto standard, this is the requirement.

16.13 MSEDCL is procuring large quantity of meters. As such manufacturer have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing & Quality Control Cell / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

17.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the above diagram. The diagram & terminal marking on sticker shall not be allowed.

18.00 NAME PLATE AND MARKING OF METERS

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. Meter Serial Number shall be Bar Coded along with numeric number. The size of bar coded number shall not be less than 35x5 mm. The manufacturer's meter constant shall be marked on the name plate. Meter serial number & bar code on sticker will not be allowed.

In addition to the requirement as per IS, following shall be marked on the name plate.

(i) Purchase order no. & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Period as per tender document

(v) ISI mark

(vi) Category of Meter : **Category D3-HT(PT/CT) Consumer Meter As per IS 16444 Part-II**

The lettering shall be bold in 3 mm font.

19.00 TESTS

19.01 TYPE TESTS

The meter offered shall have successfully passed all the type tests described in IS 16444 Part II: 2017

The type test reports shall clearly indicate the constructional features of the type tested meter. Separate type test reports for each offered type of meter shall be submitted.

The type test certificates as per IS 16444 Part II: amended up to date shall be submitted along with the offer and the same shall not be more than 5 years at the time of submission.

All the type test reports shall be got approved from the Chief Engineer, MSEDCL, Testing & Quality Control Cell, Prakashgad, Mumbai.

All the Type Tests specified in the technical specifications shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as ERDA, ERTL, CPRI, etc. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix - C of Latest – standardization of AC static electrical energy meters – NPL / CQAL / ERTL / ERDA at the sole discretion of the purchaser at the purchaser's cost. The supplier shall have no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier. For this purpose, the tenderer shall quote unit rates for carrying out each type test. However, such unit rates will not be considered for evaluation of the offer.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

19.02 ACCEPTANCE TESTS

Criteria for selection for such tests and performance requirements shall be as per IS 16444 Part II:

19.03 ROUTINE TESTS

All routine tests as per IS 16444 Part II: shall be carried out on all the meters.

19.04 ADDITIONAL ACCEPTANCE TESTS

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 16444 Part-II (amended up to date)

(a) **OTHER ACCEPTANCE TESTS**

i) Meters shall be tested for tamper conditions as stated in this specification.

ii) Glow wire testing for poly-carbonate body.

iii) Power consumption tests shall be carried out.

The meter shall comply all the tests for external AC / DC magnetic field as per IS 16444 Part II: Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor in all the three phases. After removal of magnet, meter shall be subjected to accuracy test as per IS 16444 Part II: No deviation in error is allowed in the class index as per IS 16444 Part II:

iv) The meter shall withstand impulse voltage at 6 kV.

v) The meter shall remain immune for the test of electromagnetic HF/RF defined under the test no. 4.0 for EMI/EMC of IS 16444 Part II:

Jammer test for sample meters shall be carried out at MSEDCL's Testing Division.

The tests 20.04 (b) (i) to (iii) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 20.04 (b) (iv) to (vi) shall be carried out on one sample from first lot as per procedure laid down in IS 16444 Part II: The test report shall be got approved from Chief Engineer, Testing & Quality Control Cell before commencement of supply.

(i) For influence quantities like, voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error shall be as per IS 16444 Part II:

20.00 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of meters in schedule 'A' attached. The offers without the details in Schedule 'A' stand rejected.

21.00 PRE-DESPATCH INSPECTIONS

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases. The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification.

The MSEDCL's representative / Engineer attending the above testing will carry out testing as per IS 16444 Part II: & this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division & the Executive Engineer, Inspection Wing.

22.00 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing)

From each lot (lot means the total number of meters received in a Store out of inspected and approved lot by E.E.(IW) or purchaser's representative under one approval letter) of meters received at Stores, 5 sample meters shall be drawn (meters received in damage condition shall not be selected as samples) and these meters will be tested by our Testing Engineer in presence of Supplier's representative jointly for (i) no load condition test, (ii) limits of error test (iii) starting current test, (iv) repeatability of error test (v) tamper conditions and (vi) data downloading time as per this specification.

The 5 days advance intimation will be given to the supplier and if the suppliers fail to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of supplier's representative. If the meters failed in above random sample testing, the lot will be rejected.

23.00 GUARANTEE

The meter supplied shall be guaranteed as per tender document. Bidders shall guarantee to replace free of cost the meters which are found defective / inoperative at the time of installation, or become inoperative / defective during guarantee period. Replacements shall be effected within one month from the date of intimation. If the defective meters are not replaced within the specified period above, MSEDCL shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

24.00 PACKING

24.01 The meters shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

24.02 The following information shall be furnished with the consignment:

- Name of the consignee
- Details of consignment
- Destination
- Total weight of the consignment
- Sign showing upper / lower side of the crate
- Sign showing fragility of the material
- Handling and unpacking instructions
- Bill of Materials indicating contents of each package & spare material.

25.00 TENDER SAMPLE

Tenderer are required to submit meter samples as per the quantity as mentioned in tender document of offered type / item and they shall be as per technical specifications from any one of the factories on or before the time & date stipulated for submission of offer for testing the sample meters in third party NABL Lab like ERDA, CPRI, CIPET, ERTL, etc. The offer of those eligible bidders shall only be considered if the sample passes the tests at NABL Lab. The results of NABL Lab shall not be disputed and same shall be binding on the bidder. The required information such as Manufacturer's Name or Trade Name, Sr. No., ISI Certification No., etc. shall be on stickers to be affixed on outer portion of sample meters being submitted along with the offer. Such information shall not be embossed or printed on any part of the sample meter.

Out of these, one sample shall be without Ultrasonic/Chemical welding to confirm constructional features.

26.00 QUALITY CONTROL

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team should be given all assistance and co-operation for inspection and testing at the bidder's works.3 tender samples should be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples.

27.00 MINIMUM TESTING FACILITIES

27.01 Manufacturer shall posses fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS 16444 Part II: (amended up to date). In addition, this facility shall produce Test Reports for each and every meter. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly. The list of testing equipments shall be enclosed. The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests:

Sr. No.	Name of Test
(1)	A.C. Voltage test
(2)	Insulation Resistance Test
(3)	Test of Accuracy Requirement
(4)	Test on limits of errors
(5)	Test on meter constant
(6)	Test of starting condition
(7)	Test of no-load condition
(8)	Repeatability of error test
(9)	Test of power Consumption
(10)	Vibration test
(11)	Shock Test

(12)	Transportation Test - as per MSEDCL specification
(13)	Tamper conditions - as per MSEDCL specification
(14)	Glow Wire Test
(15)	Long duration test
(16)	Flammability Test
(17)	The manufacturer shall have duly calibrated RSS meter of class 0.01 accuracy

27.02 METER SOFTWARE

The Bidders will have to get appraised & obtain CMMI – Level III within one year from date of letter of award.

27.03 Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, shall the circumstances warrant such assessment in the overall interest of the Purchaser.

28.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING

28.01 Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components, etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block /

stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

The manufacturer shall submit the list of plant and machinery along with the offer.

28.02 MANUFACTURING ACTIVITIES

Quality shall be ensured at the following stages:

(a) At PCB manufacturing stage each board shall be subjected to computerized bare board testing.

(b) At insertion stage all components should under go computerized testing for conforming to design parameters and orientation.

(c) Complete assembled and soldered PCB should under go functional testing using Automatic Test Equipments (ATEs)

(d) Prior to final testing and calibration, all meters shall be subjected to ageing test (i.e. Meters shall be kept in ovens for 72 hours at 55^0C temperature and atmospheric humidity under real life condition at it's full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.

(e) The calibration of meters shall be done in-house.

(f) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.

(g) Bought out items: A detailed list of bought out items which are used in the manufacture of the meter shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

(h) List of Plant and Machinery:

Sr. No.	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meters	Routine Testing and Calibration of Meters
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meters

3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meters Class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meters
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool	Tool fabrication and Die

	Fabrication machine	manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meters
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meters
30	Short term over Current testing setup	Type testing of Meters
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meters
33	Composite Environmental testing chambers	Type testing of Meters

29.00 QUALITY ASSURANCE PLAN

29.01 The tenderer shall invariably furnish QAP as specified in Annexure I along with his offer. The QAP shall be adopted by him in the process of manufacturing.

29.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

30.00 COMPONENT SPECIFICATION.

As per Annexure II enclosed.

31.00 SCHEDULES.

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'A' … Guaranteed and technical particulars. (As per GTP uploaded on e -tendering site)

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard shall not be

entertained. If it is observed that there are deviations in the offer in Guaranteed Technical Particulars, then, such deviations shall be treated as deviations.

ANNEXURE I

QUALITY ASSURANCE PLAN

A) The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates:

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and list of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offers.

ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.

The quality assurance plan and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following:

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorise work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization.

- The duties and responsibilities assigned to staff ensuring quality of work.
- The system for purchasing taking delivery and verification of material.
- The system for ensuring quality workmanship.
- The system for retention of records.
- The arrangements for contractor's internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii) Quality Plans:

- An outline of the proposed work and programme sequence. The structure of the contractor's organization for the contract.
- The duties and responsibilities assigned to staff ensuring quality of work.
- Hold and notification points.
- Submission of engineering documents required by the specification.

- The inspection of materials and components on receipt. Reference to the contractor's work procedures appropriate to each activity.
- Inspection during fabrication/ construction.
- Final inspection and test.

ANNEXURE II

COMPONENT SPECIFICATION

The make/grade and the range of the components should be from the following list makes or equivalent reputed makes

Sr. No.	Component function	Requirement	Makes and Origin
1	Current Transformers	The Meters shall be with the current transformers as measuring elements.	The current transformer shall withstand of IS 16444 Part-II
2	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	**USA:** Analog Devices, Cyrus Logic, Atmel, Philips, Teridian. Dallas, ST, Texas Instruments, Motorola, Maxim, National Semiconductors, Freescale, Onsemiconductors **Germany:** Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria:** AMS **Holland:** Philips (N X P) **Taiwan:** Prolific
3	Memory chips	The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges.	**USA:** Atmel, Teridian, Philips ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu),

		There shall be security isolation between metering circuit, communication circuit, and power circuit.	Ramtron. **Japan:** Hitachi, Renasas. **Germany:** Siemens
4	Display modules	a) The display modules shall be well protected from the external UV radiations. b) The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters. c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type). d) It shall be trans-reflective HTN (Hyper Twisted Nematic (120°)) or STN (Super Twisted Nematic (160°)) type industrial grade with extended temperature range.	Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics **Singapore:** E-smart, Bonafied Technologies, Display Tech, **Korea:** Advantek, Jebon, Union Display Inc., **Japan:** Hitachi, Tianma, Sony, L&G, Holtek, Haijing. **Malaysia:** Crystal Clear Technology. **Hong kong:** Genda **China:** Success, Tianma Or any other reputed make.
5	Communication Modules	Communication modules shall be compatible for the two ports (one optical port for communication with meter reading instruments & the other hardwired RS 232 port to communicate with various modems for AMR)	**USA:** HP, Optonica, National Semiconductors, **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek Or any other reputed make
6	Optical port	Optical port shall be used to transfer the meter data to meter reading instrument.	**USA:** HP, National Semiconductors, Maxim

		The mechanical construction of the port shall be such to facilitate the data transfer easily.	**Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek Or any other reputed make
7	Power supply	The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	SMPS Type
8	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** National Semiconductors, Atmel, Philips, Texas Instruments, BC Component Analog devices, ST, Maxim, Siemens, PHYCOMP, YAGEO, DRALORIC, KOA, WELWYN, OSRAM, Kemet Onsemiconductors, Freescale, Intersil, Raltron, Fairchild, Muruta, Agilent, AVX, Abracon, Sipex, Diode Inc., Honeywell, Power Integration, Fox, Roham **Japan:** Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung, Panasonic **India:** Keltron, Incap,

			VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic components Pvt. Ltd., Cermet, CTR. **Korea:** Samsung **Germany:** Vishay, Epcos, Diotech, Kemet, Infineon **Taiwan:** Yageo. Or any other reputed make
9	Mechanical parts	(i) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. (ii) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
10	Battery	Chargeable / Non chargeable maintenance free guaranteed life of 10 years.	**USA:** Maxell, Renata **Japan:** Panasonic, Sony, Mitsubishi, Sanyo **Germany:** Varta, Tedirum **France:** Saft **Korea:** Tekcell, Vitzrocell Or any other reputed make
11	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS	**USA:** Philips, Dallas Atmel, Motorola, Microchip, Epson, ST,

		standards.	Teridian **Japan:** NEC or Oki. Or any other reputed make
12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

ANNEXURE – III

MSEDCL DEFINED OBIS CODES FOR PARAMETERS NOT PRESENT IN IS 16444 Part-II:

NO.	PARAMETERS	OBIS Code						Interface Class No./ Attribute
		A	B	C	D	E	F	
1.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)	1	0	5	8	1	255	3/2
2.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)	1	0	5	8	2	255	3/2
3.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)	1	0	5	8	3	255	3/2
4.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)	1	0	5	8	4	255	3/2
5.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)	1	0	8	8	1	255	3/2
6.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)	1	0	8	8	2	255	3/2
7.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)	1	0	8	8	3	255	3/2
8.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)	1	0	8	8	4	255	3/2

SCHEDULE 'A'

GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

ITEM NAME	**THREE PHASE FOUR WIRE CT / PT OPERATED 5 AMPS OR 1 AMPS FULLY STATIC 0.2 S ACCURACY CLASS SMART HT ENERGY METER AS PER IS 16444, PART-II**	
SR. NO.	**GTP PARAMETERS**	**GTP VALUES**
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TO BE FILLED BY MANUFACTURER
2.	MAKE AND TYPE OF METER	TO BE FILLED BY MANUFACTURER
3.	APPLICABLE STANDARD IS AS PER IS 16444 Part II:	YES
4.	METER BEARS ISI MARK	YES
5.	FREQUENCY	50 HZ ±5%
6.	ACCURACY CLASS OF METER	0.2S (FOR ACTIVE AND REACTIVE ENERGY)
7.	PT SECONDARY VOLTAGE	63.5 V PH-N
8.	RATED VOLTAGE	110 V PH-PH OR 3 X 63.5 V PH-N
9.	VOLTAGE RANGE	+15% TO – 30% OF RATED VOLTAGE
10.	BASIC CURRENT (IB) OF METER	1 AMP; 5 AMPS.
11.	MAXIMUM CONTINUOUS CURRENT (IMAX)	2 TIMES (200 %) OF IB.
12.	SHORT TIME OVER CURRENT	AS PER IS 16444 Part II:

13.	STARTING CURRENT OF METER	0.1% OF IB.
14.	CT RATIO OF METER	1 / 1 AMPS; 5 / 5 AMPS
15.	POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT	AS PER IS16444
16.	POWER CONSUMPTION IN EACH CURRENT CIRCUIT	AS PER IS16444
17.	POWER FACTOR	ZERO LAG TO UNITY TO ZERO LEAD TO UNITY
18.	POWER SUPPLY IS SMPS & MICRO CONTROL TYPE	YES
19.	STANDARD REFERENCE TEMPERATURE OF METER	27^0 C
20.	MEAN TEMPERATURE CO-EFFICIENT	SHALL NOT EXCEED 0.03%.
21.	KVA MD PROVIDED	YES
22.	OPAQUE METER BASE & TRANSPARENT/OPAQUE TOP COVER IS MADE OUT OF, UNBREAKABLE, TOUGH, NON -BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE MATERIAL SO AS TO GIVE IT AND QUALITIES.	YES
23.	POLY CARBONATE BODY OF METER CONFORMS TO IS: 11731 (FV-2 CATEGORY)	YES
24.	POLY CARBONATE BODY MEETS TEST REQUIREMENT OF (a) HEAT DEFLECTION TEST AS PER ISO 75 > 115^0C	YES
25.	(b) GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 1984 OR IEC PUB 60695-2-12 AT 650^0C	YES
26.	(c) BALL PRESSURE TEST AS PER IEC--60695-10-2	YES
27.	(d) FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986	YES

28.	TYPE TEST REPORT NOS. & DATE OF ABOVE (A) TO (D)	TO BE FILLED BY MANUFACTURER
29.	PHYSICAL WATER ABSORPTION VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
30.	THERMAL HDDT VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
31.	TENSILE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
32.	FLEXURE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
33.	MODULUS OF ELASTICITY OF METER BODY	TO BE FILLED BY MANUFACTURER
34.	IZOD IMPACT STRENGTH OF METER BODY NOTCHED AT 23°C	TO BE FILLED BY MANUFACTURER
35.	POLY-CARBONATE OPAQUE BASE AND TRANSPARENT/OPAQUE TOP COVER IS ULTRA-SONICALLY/CHEMICAL WELDED (CONTINUOUS WELDING)	YES
36.	THICKNESS OF MATERIAL FOR METER COVER & BASE	2 MM MINIMUM
37.	METER BODY TYPE TESTED FOR IP51 DEGREE OF PROTECTION AS PER IS: 12063 AGAINST INGRESS OF DUST, MOISTURE & VERMIN.	YES
38.	IP51 DEGREE OF PROTECTION AS PER IS: 12063 TEST CERTIFICATE NO. & DATE	TO BE FILLED BY MANUFACTURER
39.	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS WITH TWO HOLES.	TO BE FILLED BY MANUFACTURER
40.	TERMINAL BLOCK IS MADE FROM HIGH QUALITY NON-HYGROSCOPIC, FIRE RETARDANT, REINFORCED POLYCARBONATE / NON-BAKELITE MATERIAL	YES

41.	MATERIAL OF WHICH THE TERMINAL BLOCK IS MADE IS CAPABLE OF PASSING THE TESTS GIVEN IN IS: 1336O (PART 6/SEC 17), ISO 75-1 (1993) & ISO 75-2 (1993) FOR A TEMPERATURE OF 135^{0}C AND A PRESSURE OF 1.8 MPA (METHOD A)	YES
42.	TYPE TEST REPORT NOS. & DATE OF ABOVE	YES
43.	TWO SCREWS ARE PROVIDED IN EACH CURRENT & POTENTIAL TERMINAL FOR EFFECTIVELY CLAMPING THE EXTERNAL LEADS OR THIMBLES IN TERMINAL BLOCK	YES
44.	MINIMUM INTERNAL DIAMETER OF TERMINAL HOLE	TO BE FILLED BY MANUFACTURER
45.	TERMINATION ARRANGEMENT IS PROVIDED WITH AN EXTENDED TRANSPARENT TERMINAL COVER AS PER IS: 16444 Part II /2017 (AMENDED UPTO DATE) IRRESPECTIVE OF REAR CONNECTIONS	YES
46.	TERMINAL COVER IS UNBREAKABLE, TOUGH, NON -BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE & IS MADE OF THE SAME MATERIAL AS THAT OF METER BODY	YES
47.	TERMINAL COVER IS TRANSPARENT	YES
48.	TERMINAL COVER ENCLOSES ACTUAL TERMINALS, CONDUCTOR FIXING SCREWS AND A SUITABLE LENGTH OF EXTERNAL CONDUCTORS AND THEIR INSULATION	YES
49.	TERMINAL COVER IS PROVIDED WITH ONE SIDE HINGE/TWO TOP HINGES	YES
50.	INDEPENDENT SEALING PROVISION IS MADE AGAINST OPENING OF THE TERMINAL COVER AND FRONT COVER TO PREVENT UNAUTHORIZED TAMPERING	YES
51.	BIDIRECTIONAL SCREWS WITH TWO HOLES FOR SEALING PURPOSE OF TERMINALCOVER ARE	YES

	PROVIDED	
52.	FIXING SCREWS USED ON THE TERMINAL COVER FOR FIXING AND SEALING ARE HELD CAPTIVE IN THE TERMINAL COVER	YES
53.	PROPER SIZE OF GROOVES/ U-CUT PROVIDED AT BOTTOM OF TERMINAL COVER FOR INCOMING SERVICE CONNECTIONS	YES
54.	PUSH BUTTONS ARE PROVIDED AS PER SPECIFICATION	YES
55.	PROVISION FOR AT LEAST TWO SEALS TO BE PUT BY UTILITY USER	YES
56.	PROVISION OF DISPLAY OF HIGH RESOLUTION READING / ALTERNATE MODE	YES
57.	OUTPUT DEVICE FOR TESTING OF METER IN THE FORM OF BLINKING LED WITH CONSTANT PULSE RATE IS PROVIDED	YES
58.	RESOLUTION OF THE TEST OUTPUT DEVICE IS SUFFICIENT TO ENABLE THE STARTING CURRENT TEST IN LESS THAN 10 MINUTES	YES
59.	PULSE RATE OF OUTPUT DEVICE IS PROGRAMMED ACCORDING TO PRIMARY VALUES OF VOLTAGE & CURRENT & IS PROVIDED ON NAMEPLATE	YES
60.	METER CONSTANT IS INDELIBLY PRINTED ON THE NAME PLATE OF THE METER	YES
61.	METER ACCURACY NOT AFFECTED BY AC / DC MAGNETIC FIELD AS IS 16444 Part II:	YES
62.	THE METER ACCURACY SHALL NOT BE AFFECTED BY EXTERNAL AC / DC / PERMANENT MAGNETIC FIELD AS PER CBIP TECHNICAL REPORT 325 WITH LATEST AMENDMENTS. IF THE METER GETS AFFECTED UNDER INFLUENCE OF ANY MAGNETIC FIELD (AC / DC / PERMANENT), THEN THE SAME SHALL BE RECORDED AS MAGNETIC TAMPER	YES

	EVENT WITH DATE & TIME STAMPING AND THE METER SHALL RECORD ENERGY MAXIMUM VALUE CURRENT (IMAX) AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	
63.	METER IS CAPABLE TO WITHSTAND AND NOT GET DAMAGED IF PHASE TO PHASE VOLTAGE IS APPLIED BETWEEN PHASES & NEUTRAL FOR FIVE MINUTES	YES
64.	POWER SUPPLY UNIT IS MICRO CONTROL TYPE (SMPS)	YES
65.	NON SPECIFIED DISPLAY PARAMETERS IN ARE BLOCKED AND NOT ACCESSIBLE FOR REPROGRAMMING AT SITE	YES
66.	CTS ARE PROVIDED WITH MAGNETIC SHIELDING AND ARE TESTED SEPARATELY PRIOR TO ASSEMBLY	YES
67.	COMPLETE METERING SYSTEM DOES NOT AFFECTED BY EXTERNAL ELECTROMAFNETIC INTERFERRENCE	YES
68.	REAL TIME QUARTZ CLOCK IS USED IN METER FOR MAINTAINING TIME (IST) AND CALENDAR	YES
69.	RTC BATTERY IS NON – RECHARGEABLE TYPE	YES
70.	RTC PRE - PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR CORRECTION	YES
71.	MAXIMUM DRIFT TIME OF RTC PER YEAR	SHALL NOT EXCEED +/- 300 SECONDS PER YEAR
72.	DAY / DATE SETTING & SYNCHRONISATION POSSIBLE THROUGH PASSWORD / KEY CODE	YES
73.	RTC BATTERY & BATTERY FOR DISPLAY ARE SEPARATE	YES

74.	METER WITHSTANDS HIGH VOLTAGE & HIGH FREQUENCY SURGES WHICH ARE SIMILAR TO THE SURGES PRODUCED BY INDUCTION COIL TYPE INSTRUMENTS WITHOUT AFFECTING THE ACCURACY OF THE METER	YES
75.	ACCURACY OF METER IS NOT AFFECTED WITH APPLICATION OF ABNORMAL VOLTAGE / FREQUENCY GENERATING DEVICE SUCH AS SPARK DISCHARGE OF APPROXIMATELY 35 KV	YES
76.	SPARK DISCHARGE OF APPROXIMATELY 35 KV CARRIED OUT	YES
77.	METER LOGS UNSATISFACTORY OR NON FUNCTIONING OF RTC BATTERY	YES
78.	METERING PROTOCOL AS PER ANNEX E - CATEGORY C1 METERS OF IS 16444 Part II:	YES
79.	COMMUNICATION MODULE & OPTICAL PORT FOR COMMUNICATION AND WITH SEALING ARRANGEMENT ARE PROVIDED	YES
80.	DEFAULT & MINIMUM BAUD RATE OF OPTICAL PORTS IS 9600 BPS	YES
81.	INTERNAL NI-MH OR LI-ION OR NI CD MAINTENANCE FREE BATTERY OF LONG LIFE OF 10 YEARS WITH PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY	YES
82.	METER PCB IS WIRE LESS & IS MADE BY SURFACE MOUNTING TECHNOLOGY	YES
83.	METER RECORDS & DISPLAY TOTAL ENERGY INCLUDING HARMONIC ENERGY	YES
84.	NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED	YES
85.	6 (SIX) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED	YES

86.	PROVISION FOR MD INTEGRATION PERIOD OF 15 MINUTE IS MADE	YES
87.	PROVISION THROUGH COMMUNICATION DRIVEN RESET OF MD IS PROVIDED	YES
88.	PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED	YES
89.	PROVISION FOR AUTO RESET OF MD AT CERTAIN PREDEFINED PERIOD IS PROVIDED	YES
90.	ALL ANTI TAMPER FEATURES ARE INCORPORATED IN METER AS PER SPECIFICATION	YES
91.	METER LOGS TAMPER EVENTS AS PER SPECIFICATION	YES
92.	TAMPER NO. & TAMPER EVENT IS REGISTERED IN TAMPER EVENT REGISTER	YES
93.	THE NO. OF TIMES THE TAMPERING HAS BEEN DONE IS ALSO REGISTERED IN THE METER	YES
94.	METER KEEPS RECORD OF TAMPER EVENTS FOR MINIMUM 200 EVENTS ON FIFO BASIS	YES
95.	SUPPLY INDICATION IN THE FORM OF LED / LCD DISPLY IS PROVIDED	YES
96.	SUPPLY INDICATION IS VISIBLE FROM THE FRONT OF THE METER	YES
97.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF MINIMUM 6 DIGITS AND MINIMUM 8 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED	YES
98.	SIZE OF DIGITS	MINIMUM 8X5 MM
99.	AUTO DISPLAY CYCLING PUSH BUTTON WITH PERSISTENCE TIME OF 10 SECONDS IS PROVIDED	YES
100.	PUSH BUTTON FOR HIGH RESOLUTION DISPLAY /	YES

	ALTERNATE MODE OF DISPLAY IS PROVIDED	
101.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF 70^0C	YES
102.	METER IS PROGRAMMED FOR (A) MD INTEGRATION PERIOD OF 15 MINUTES	YES
103.	(B) AVERAGE POWER FACTOR WITH 2 DECIMAL DIGITS	YES
104.	(C) AUTO RESET KVAMD AT 24.00 HRS. OF LAST DAY OF THE MONTH AS PER CLAUSE 10.00 (III) OF SPECIFICATION	YES
105.	(D) ARRAY OF DATA TO BE RETAINED INSIDE THE METER MEMORY FOR THE LAST 32 DAYS FOR A CAPTURE PERIOD OF 15 MINUTES ON FIRST IN FIRST OUT BASIS (FIFO)	YES
106.	SEQUENCE OF DISPLAY PARAMETERS IS AS PER SPECIFICATIONS	YES
107.	METER RECORDS & DISPLAYS THE QUANTITES AS PER SPECIFICATION	YES
108.	DISPLAY OTHER THAN SPECIFIED IS BLOCKED	YES
109.	OTHER KVA MD VALUES ARE AVAILABLE IN RESET BACKUP DATA FOR 12 MONTHS.	YES
110.	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF 'PUSH BUTTON' IS NOT OPERATED FOR 15 SECONDS	YES
111.	BILLING DATA IS AS PER SPECIFICATION	YES
112.	PROVISION FOR RECORDING HISTORY OF BILLING PARAMETERS FOR LAST 12 MONTHS	YES
113.	PROVISION FOR LOAD SURVEY DATA FOR EVERY 15 MINUTES AND FOR PREVIOUS 32 DAYS FOR SPECIFIED PARAMETERS ON FIFO BASIS	YES

114.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 12 OF IS 15959 Part 3: & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
115.	A DLMS COMPLIANT HHU IS PROVIDED	YES
116.	PROVISION FOR AUTO POWER SAVE IS MADE ON HHU	YES
117.	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY	YES
118.	LICENSED COPIES OF BASE COMPUTER SOFTWARE ARE SUPPLIED FREE OF COST.	YES
119.	NO EDITING IN TRANSFERRED DATA IS POSSIBLE ON BASE COMPUTER AS WELL AS HHU BY ANY MEANS .	YES
120.	DOWNLOADING SOFTWARE IS SUBMITTED TO INSTALL ON OUR LAPTOP / PC FOR DIRECTLY DOWNLOADING DATA FROM METER WITHOUT THE USE OF HHU	YES
121.	SOFTWARE PROVIDED ON LAPTOP/PC IS COMPATIBLE TO READ DATA FROM USB DRIVE	YES
122.	CABLE WITH USB TERMINATION PROVIDED	YES
123.	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 32 DAYS	LESS THAN OR EQUAL TO 9 MINUTES
124.	DOWNLOADING TIME OF ONLY BILLING DATA	LESS THAN OR EQUAL TO 20 SECS
125.	PERMANENT NATURE CONNECTION DIAGRAM OF METER IS SHOWN ON INSIDE PORTION OF THE TERMINAL COVER	YES
126.	DISTINCTLY MARKED NAME PLATE WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT	YES

	STANDARDS, CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL IS PROVIDED ON METER	
127.	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER	YES
128.	CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE IS PROVIDED ON METER	YES
129.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 12 OF IS 15959 Part 3: & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
130.	CATEGORY OF METER AS “CATEGORY D3 – HT (PT / CT) CONSUMER METER” IN 3 MM BOLD FONT IS MARKED ON NAME PLATE	YES
131.	WHETHER METER IS TYPE TESTED	YES
132.	TYPE TEST REPORT NOS. & DATE OF METER	TO BE FILLED BY MANUFACTURER
133.	METER PROTOCOL REPORT NOS. & DATES	TO BE FILLED BY MANUFACTURER
134.	ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS 16444 Part II THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY	TO BE FILLED BY MANUFACTURER
135.	TRANSPORTATION TEST IS CARRIED OUT	YES
136.	METER ARE GUARANTEED AS PER TENDER DOCUMENT	YES
137.	GUARANTEE TO REPLACE METERS FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES

138.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	YES
139.	IN HOUSE TESTING FACILITY IS AVAILABLE FOR (A) AC VOLTAGE TEST	YES
140.	(b) INSULATION RESISTANCE TEST	YES
141.	(c) ACCURACY REQUIREMENT	YES
142.	(d) TEST ON LIMITS OF ERRORS	YES
143.	(e) TEST ON METER CONSTANT	YES
144.	(f) TEST OF STARTING CONDITION	YES
145.	(g) TEST OF NO-LOAD CONDITION	YES
146.	(h) REPEATABILITY OF ERROR TEST	YES
147.	(i) TEST OF POWER CONSUMPTION	YES
	(j) TAMPER CONDITIONS AS PER MSEDCL SPECIFICATION	YES
148.	(k) GLOW WIRE TEST	YES
149.	(l) LONG DURATION TEST	YES
150.	(m) FLAMABILITY TEST	YES
151.	(n) MANUFACTURER HAVE DULY CALIBRATED RSS METER OF CLASS 0.01 ACCURACY	YES
152.	NO. OF SAMPLE METERS AS PER TENDER DOCUMENT & TECHNICAL SPECIFICATIONS ARE SUBMITTED ALONG WITH OFFER	YES
153.	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	YES
154.	AGEING TEST FOR 72 HOURS AT 55^0 C	YES

	TEMPERATURE AND ATMOSPHERIC HUMIDITY UNDER REAL LIFE CONDITION AT FULL LOAD CURRENT TO ELIMINATE INFANT MORTALITY IS CARRIED OUT	
155.	GUARANTEE TO REPLACE METERS FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES
156.	QUALITY ASSURANCE PLAN AS PER SPECIFICATIONS IS ENCLOSED	TO BE FILLED BY MANUFACTURER
157.	COMPONENT SPECIFICATION AS PER SPECIFICATION	YES

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

LT AC THREE PHASE, FOUR WIRE, 40 - 200 AMPS ENERGY METER WITH IN-BUILT CT & MODEM (CT EMBEDDED METER) FOR 63/100/200 KVA DISTRIBUTION TRANSFORMER

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1.00 SCOPE

1.01 This specification covers the design, engineering, manufacture, assembly, inspection, testing at manufacturers Works before dispatch and supply of high precision LT AC Three Phase Four Wire **3 x 240 volt, 40 - 200 Amp** fully static and AMR compatible TOD Tri-Vector Energy Meter of accuracy class 1.0, capable of primarily performing functions of tariff meters and GPRS enabled modem and suitable accessories for automatic and remote data transfer from energy meter. The complete meter unit i.e. meter, internal CTs and modem shall be housed in the same enclosure. The meter shall have provision in such a way that supply / service cable of consumer shall be directly passed through the meter for current measurement. Piercing screws shall be used in the meter for voltage connection The meter shall be capable to record and display active energy, apparent energy, reactive energy (kVArh lag and kVArh lead separately) and maximum demand KW / KVA for Three Phase Four Wire AC balanced / unbalanced loads for a power factor range of Zero lag - unity – Zero lead-unity. Meters shall be supplied along with base-computer software (BCS) suitable to read the meter remotely as per the details given in this specification.

1.02 It is not the intent to specify completely herein all the details of the design and construction of material. However the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the right to reject any work or material which in his judgment is not in accordance therewith. The offered materials shall be complete with all components, accessories necessary for their effective and trouble free operation in the system for energy measurement. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

1.03 It is compulsory that the offered meter shall bear BIS certification i.e. the meters shall be ISI marked and the bidder shall have to furnish valid ISI licence along with the offer, which, if considered necessary, may be verified by the purchaser.

2.00 MINIMUM TESTING FACILITIES

2.01 Manufacturer shall posses fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS: 13779 / 1999 (amended up to date).

In addition, this facility shall produce Test Reports for each and every meter. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly. The list of testing equipments shall be enclosed.

2.02 The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests.

Sr. No.	**Name of Test**
(a)	A.C. Voltage test
(b)	Insulation Resistance Test
(c)	Test of Accuracy Requirement
(d)	Test on limits of errors
(e)	Test on meter constant
(f)	Test of starting condition
(g)	Test of no-load condition
(h)	Repeatability of error test
(i)	Test of power Consumption
(j)	Vibration test
(k)	Shock Test
(l)	Tamper conditions - as per MSEDCL specification
(m)	Glow Wire Test
(n)	Long duration test
(o)	Flammability Test
(p)	The manufacturer shall have duly calibrated RSS meter of class 0.1 accuracy

2.03 Meter Software

The Bidders will have to get appraised & obtain Capability Maturity Model Integration (CMMI)– Level III within one year from date of letter of award.

2.04 Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, shall the circumstances warrant such assessment in the overall interest of the Purchaser.

3.00 STANDARDS TO WHICH METERS SHALL COMPLY

Unless otherwise specified elsewhere in this specification, the performance and testing of the meters shall conform to the following Indian / International Standards and all related Indian / International standards to be read with upto-date and latest amendments / revisions thereof:

IS: 13779 / 1999 amended upto date and other relevant IS specifications including CBIP Tech report 325 amended upto date,

IEC 62053-21 Specification for AC static watt-hour meter for class 1 & 2

IS: 15959 / 2011 amended upto date for Data Exchange for Electricity Meter Reading, Tariff & Load Control – Companion Specification

CEA regulations and MERC guidelines with latest amendments.

IS: 15707 / 2006: Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice.

IS: 12063 Specification for degree of protection for enclosure.

IS: 11731 Specification for engineering plastic

The specification given in this document supersedes the relevant clauses of IS: 13779 / 1999 (amended up to date) wherever applicable.

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standard mentioned above, also shall be considered. For conflict related with the specification, the order of priority shall be – (i) this technical specification, (ii) IS: 13779 / 1999 amended upto date.

Bidder must posses the following certifications at the time of submission of the bid.

(a) ISO 9000.

(b) ISO 14000.

4.00 SERVICE CONDITIONS

As per IS: 13779 / 1999 (amended upto date), the meter to perform satisfactorily under Non - Air Conditioned environment (within stipulations of IS).

The meter to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

Environmental Conditions

a)	Maximum ambient temperature	55^0 C
b)	Maximum ambient temperature in shade	45^0 C
c)	Minimum temperature of air in shade	35^0 C
d)	Maximum daily average temperature	40^0 C
e)	Maximum yearly weighted average temperature	32^0 C
f)	Relative Humidity	10 to 95 %
g)	Maximum Annual rainfall	1450 mm
h)	Maximum wind pressure	150 kg/m^2
i)	Maximum altitude above mean sea level	1000 meter
j)	Isoceraunic level	50 days/year
k)	Seismic level (Horizontal acceleration)	0.3 g

l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

5.00 GENERAL TECHNICAL REQUIREMENTS

Meters are required for installation in the premises of LT consumers. The basic system parameters wherein these meters will be installed shall be as under:-

1.	Type of installation	Indoor/Outdoor
2.	TYPE	ISI marked LT AC, Three Phase, four wire, 40 - 200 Amps fully Static AMR compatible TOD Tri – vector Energy Meters with in-built CTs & Modem with RS-232 port for measurement of

		different electrical parameters including Active Energy (kWh), Reactive Energy (kVArh), Apparent Energy (kVAh) etc. in three phase, four wire balanced / unbalanced loads of LT Consumers
3.	ACCURACY CLASS	1.0 (FOR ACTIVE AND REACTIVE ENERGY)
4.	CURRENT RATING	40 – 200 Amps
5.	RATED BASIC CURRENT (Ib)	40 Amps per phase
6.	MAXIMUM CONTINUOUS CURRENT (Imax)	5 times (500 %) of Ib. The meter shall work accurately at 120% of Imax.
7.	STARTING CURRENT	0.2% of Ib.
8.	SHORT TIME CURRENT	As per IS 13779 / 1999.
9.	RATED VOLTAGE	3x240 Volts Phase to Neutral
10.	VOLTAGE RANGE	+ 20 % to – 40 % of rated voltage.
11.	TEMPERATURE	The standard reference temperature for performance shall be 27^{0}C. The mean temperature co-efficient shall not exceed 0.07%.
12.	FREQUENCY	50 Hz ±5%
13.	NO. OF PHASES	3 phase 4 wire
14.	SYSTEM EARTHING	Solidly grounded

15.	POWER FACTOR	Power Factor range: Zero Lag to unity to Zero Lead to unity Avg. P.F = $\frac{\text{Total(kWh)}}{\text{Total (kVAh)}}$ kVAh= $\sqrt{(kWh)2 + (RkVAhlag + RkVAhlead)2}$
16.	POWER CONSUMPTION	The active and apparent power consumption in each voltage circuit at reference voltage, reference temperature and reference frequency shall not exceed 2.0 W and 10 VA.
17.	AUXILIARY POWER	The meter shall draw power for working of electronic circuit from phase & neutral.
18.	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving parts; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.1 class) software based test bench.
19.	POWER SUPPLY	Switched-Mode Power Supply (SMPS)
20.	ISI MARK	The meter so supplied must bear ISI Mark.

6.00 CONSTRUCTIONAL REQUIREMENT / METER COVER & SEALING ARRANGEMENT

6.01 The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

(a) personal safety against electric shock:

(b) personal safety against effects of excessive temperature;

(c) protection against spread of fire;

(d) protection against penetration of solid objects, dust & water in meter.

6.02 Meters covered under this specification shall be fully static type with non-volatile memory to register various billing parameters and complete with other features as detailed out in this specification. Any other design meeting technical specification or features/accuracy etc., better than this specification and manufactured as per relevant IEC / IS / CBIP report shall also be acceptable.

6.03 Meter shall be installed in consumer premises out door or indoor, directly under the sun and extreme weather conditions. Suitability of such use shall be confirmed.

6.04 Meters shall be suitable for accurate measurement and display of energy and other billing parameters within the specified limits of errors under balanced and unbalanced load conditions in a poly phase network.

6.05 All insulating materials used in the construction of meters shall be non-hygroscopic, non-ageing and of tested quality.

6.06 All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results. The construction of the meter shall be such as to be sealed independently and prevent unauthorised tampering.

6.07 Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions.

6.08 The electrical connections shall be such as to prevent any opening of the circuit under normal conditions of use as specified in the standard.

6.09 The construction or the meter shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of the wiring, screws, etc. The meter shall not produce appreciable noise in use.

6.10 MATERIAL USED

6.10.1 The meter base & cover shall be made out of transparent / opaque unbreakable, high grade, fire resistant Polycarbonate material so as to

give it tough and non-breakable qualities. The meter case shall also have high impact strength.

6.10.2 The entire design and construction shall be capable of withstanding likely to occur in components is preferred for this purpose. Components used shall be of high quality and comply with International Industrial Standard practices.

6.11 Construction of the meter shall be such as to permit sealing of meter cover, piercing screw cover, etc. independently to ensure that the internal parts are not accessible for tampering without breaking the seals.

6.12 METER BODY

6.12.1 The poly carbonate body of the meter shall conform to IS: 11731 (FV-2 category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 1984 or IEC-60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2) 1986. The type test certificate shall be submitted along with the offer.

6.12.2 The meter shall be projection type and shall be dust and moisture proof. The meter cover shall be secured to base by means of sealable unidirectional captive screws. The provision shall be made on the Meter for at least two seals to be put by utility user.

6.12.3 The meter shall be compact and reliable in design e.g. to transport and immune to vibration and shocks involved in transportation/ handling.

The construction of the meter shall be suitable for its purpose in all respects and shall give assurance of stable and consistent performance under all conditions especially during dust storms / heavy rains / very hot days.

6.12.4 The meter shall conform to the degree of protection **IP 54 of IS: 12063 / IEC: 529** for protection against ingress of dust, moisture and vermin's. The type test certificate shall be submitted along with the offer.

6.12.5 The thickness of material for meter cover and base shall be 2 mm (minimum).

6.13 METER CASE AND FRONT DOOR

6.13.1 The meter shall have a case, which shall be sealed in such a way that the internal parts of the meter are not accessible unless body is broken. Minimum three sets of seals i.e. for Piercing screws, meter

cover and the front door shall be provided. The case shall be so constructed that any temporary deformation may not effect the satisfactory operation of the meter.

6.14 The meter unit shall have front-hinged door with suitable sealing arrangement (screws) and transparent window to view the display parameters. The front door shall be sealed independently over the terminal cover. Approach to the reading button and RS-232 port shall only be possible after opening the front cover or meter unit shall have one push button on outside of transparent meter cover which shall be accessible from font side of meter where communication port shall be provided on right side of the meter with proper sealing arrangement.

6.15 TERMINALS & TERMINAL BLOCK

6.15.1 The meter shall have provision in such a way that service cable of consumer shall be directly passed through the meter for measurement. Piercing screws shall be used in the meter for voltage connection.

6.15.2 The meter shall be suitable to accommodate aluminium cable of 200A current carrying capacity. Piercing screw shall have the quality and capability to puncture the cable of 200 A capacity.

6.15.3 The meter connection arrangement shall be such that so there is no need to remove insulation for connecting cable for current measurement. Design shall support thread through concept where connecting cable directly passed through the meter for measurement.

6.15.4 As the cable directly passed through the meter, the offered meter shall not have provision for meter terminal connection as well as terminal block.

6.15.5 The entire design and 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 vibrations during transportation and handling.

6.15.6 The voltage circuit and current circuit shall be solidly connected inside the meter body without any link.

A firm connection shall be established within the meter case to energise the voltage/current circuit. The connections shall be as per the recommended methods given in IS: 13779 / 1999 (amended upto date).

6.16 TERMINAL (PIERCING SCREW) COVER

6.16.1 The PT Piercing screw cover for the meter shall be extended type, which can be sealed independently & over the meter cover. The PT terminals shall not be accessible without removing the seals of the terminal cover when energy meter is mounted on the meter board/ wall.

6.16.2 Suitable Piercing teeth shall be provided for PT connection, connector shall have multiple teeth (minimum 5) such that in any case minimum 3 teeth shall pierce the insulation and the connection shall be firm.

6.17 INSULATION

The meter shall have durable and substantially continuous enclosure made of wholly insulating material, including the terminal cover, which envelops all metal parts with the exception of small parts and shall withstand an insulation test at 4 KV.

6.18 SEALING OF THE METER

6.18.1 Proper sealing arrangement shall be provided on the meter to make it tamper proof and avoid mishandling by any unauthorised person. It is necessary to provide unidirectional screws with single holes for sealing purpose.

6.18.2 The meter body shall be provided with minimum 2 nos. seals.

6.18.3 All the seals shall be provided on front side only.

6.18.4 Access to the working part shall not be possible without breaking the seals.

6.18.5 Provision of at least 2 nos. seals on front door, 1 no. seal on communication port, 2 nos. seals on the piercing screw terminal cover shall also be made. Rear side sealing arrangement is not acceptable.

6.18.6 The seals provided shall have proper locking arrangement to avoid opening of the seal in any case by means of tampering.

6.18.7 Beside body seals provided by the manufacturer, provision shall also be made to provide at least one utility lash wire seals on the body.

6.19 RESISTANCE TO HEAT AND FIRE

The piercing screw block, the piercing screw cover, the insulating material retaining the main contacts in position and the meter body shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them. The material of the piercing screw block shall not deflect under heating. To comply therewith, they must fulfill the tests as specified in

12.4 of IS: 13779 / 1999 amended upto date.

6.20 A push button shall be provided on the front side of the meter for high resolution reading of display with two decimal digits as brought out elsewhere in this specification (optional). Likewise, 2 push buttons shall be provided for scrolling the parameters in Alternate Display (On Demand) mode.

6.21 OUTPUT DEVICE

Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front. The test output device shall be provided in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes and accuracy test at the lowest load shall be completed with desired accuracy within 5 minutes. The pulse rate of output device (separate blinking LED must be provided for each parameter) which is Pulse / kWh and Pulse / kVArh (meter constant) shall be indelibly provided on the nameplate. It shall be possible to check the accuracy of active energy measurement of the meter on site by means of LED output.

6.22 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor

6.23 Power supply unit shall be micro control type instead of providing conventional transformer and then conversion to avoid magnetic influence.

6.24 REAL TIME INTERNAL CLOCK (RTC)

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 Seconds per year. Facility for adjustment of real time shall be provided with proper security. The calendar and the clock shall be correctly set to Indian Standard Time.

The clock day / date setting and synchronization shall only be possible through password / Key code command from one of the

following:

a) Laptop or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger 'PC'.

The RTC battery & the battery for display in case of power failure shall be separate.

6.25 Non-specified display parameters in the meter shall be blocked and same shall not be accessible for reprogramming at site through any kind of communication

6.26 Complete metering system & measurement shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech-report 325 (amended up to date).

6.27 SELF DIAGNOSTIC FEATURES

(a) The meter shall keep log in its memory for unsatisfactory / non - functioning of Real Time Clock battery/ Low Battery indication on display and can be downloaded for reading through RS-232 port to read in base computer.

(b) The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.

(c) LCD Test display shall be provided for checking of all display Segments.

6.28 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal battery may be provided.

The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided. Alternatively, push button provided for displaying alternate mode (On Demand Mode) parameters shall also be acceptable for activation of battery during power OFF condition.

After activating the battery during power OFF condition, the meter shall display all Default Display (Auto Scrolling Mode) parameters only once, after which the battery shall switch OFF automatically. The battery shall be locked after 3 operations during one power OFF cycle.

As soon as the supply is resumed to meter, the battery shall automatically come to normal.

Billing Data downloading and Reading shall also be possible in power outage condition.

6.29 PCB used in meter shall be made by Surface Mounting Technology.

6.30 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phase to neutral for 5 minutes.

6.31 The meter shall record and display total energy including Harmonic energy.

6.32 PERFORMANCE ON DC INJECTION

Apart from all the technical requirements as specified above, it shall also be ensured that meter shall not stop and record consumption accurately even on injection of DC voltage in neutral.

6.33 The accuracy of the meter and the measurement by meter shall not get influenced by injection of High frequency AC Voltage / chopped signal / DC signal and harmonics on the terminals of the meter. The meter accuracy shall not be affected by magnetic field from all sides of the meter i.e. front, sides, top and bottom of the meter.

6.34 The meter shall withstand any type of High Voltage and High Frequency surges, which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter.

The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 kV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(a) On any of the phases or neutral terminals

(b) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(c) At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device.

6.35 COMMUNICATION CAPABILITY

(a) The meter shall be provided with a hardware port compatible with RS 232 specifications (RJ - 11 / RJ - 45 type is also acceptable)

which shall be used for local data downloading through a DLMS compliant HHU, if any.

It shall be possible to download all data through RS-232 port provided on the meter. RS-232 port or TCP / IP port, as required, is also acceptable.

Sealing arrangement for RS-232 port shall be provided. The RS-232 port shall support the default and minimum baud rate of 9600 bps. Necessary chord for RS-232 Port of minimum length of 1 (One) metre in the ratio 50:1 shall be provided free of cost.

(b) **Remote communication mode for data retrieval**

Meter shall be provided with 4G intelligent modem embedded in meter body.

Modem should be compatible with data transmission over 2G, 4G/LTE. Modem should have facility for fall back to 2G networks, where 4G network is not available. Modem should support both Data and SMS transmission. It should have GPRS/EDGE features.

Modem should be capable of working on intelligent mode (Push mode) and transparent mode (Pull mode). Modem should have store and forward feature, while working in intelligent mode. By default, the modem should be working on intelligent mode. It should be possible to configure the modem for schedule to download data from meter (15 minutes/hourly/daily/weekly/monthly) through configuration tool and SMS. Modem should automatically download data from meter at configured intervals and this data should be stored in the modem. Also modem should automatically establish the connection with server configured and data stored in modem should be pushed to server at configured intervals.

It should be possible to convert mode of working of modem from intelligent mode (Push mode) to transparent mode (Pull mode) and vice-versa. Such conversion should be done through locally and remotely, over the air through configuration tool or through SMS. While working on transparent mode, modem should act as a completely transparent channel i.e. the Commands received from Centralized Head End System/MDAS should be conveyed to meter and data from meter should be conveyed to Centralized Head End System/MDAS without any changes in the mode.

Modem shall be connected such that the RS-232 port of meter shall be free for the data downloading.

On insertion of SIM card, modem should configure APN settings automatically based on SIM card inserted. APN details of network

service providers will be shared with successful bidders.

Configuration of modem using modem configuration utility:

It should be possible to read and write various modem configuration parameters such as baud rate, parity, data bits, APN details, Master SIM numbers etc. locally using PC/Laptop & over the air, remotely using this configuration utility. Also it should be possible to update the modem firmware locally and remotely using modem configuration utility.

Bidder should submit the configuration utility along with offer.

Configuration over the air:

Modem configuration parameters such as baud rate, parity, data bit, flow control, APN details with user name and Password, Network signal strength (CSQ),Server IP, Modem listening port, IP address of SIM, Master SIM numbers configured should be read by sending SMS to modem from any mobile phone. The SMS sent by modem should be readable in mobile phones with various operating systems e.g. Android, i-OS, Windows etc.

Modem can be configured for various parameters such as baud rate, parity, data bit, flow control, APN details with user name and Password, Server IP, Modem listening port, Master SIM numbers by sending SMS to modem from master SIM.

Modem should also support rebooting through SMS. SMS will be sent through master SIM only.

The bidder should share set of instructions required for over the air configuration through SMS.

Bidder has to provide software application to receive data sent by modems working on intelligent mode. It should be possible to generate XML file of meter data as per MIOS format, through this application. This application should be handed over to MSEDCL and the same should be deployed at MSEDCL. The demonstration of this application is to be done by bidder at the time of evaluation of sample meter.

6.36 RETENTION TIME OF THE NON-VOLATILE MEMORY

The meters shall make use of Non Volatile Memory capable of storing & retaining all the data required to be stored, without the help of any power source or battery back up.

The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does

not need any battery backup. The NVM shall have a minimum retention period of 10 years.

6.37 WIRE / CABLE LESS DESIGN

The meter shall be wireless to avoid improper soldering & loose connection / contact.

6.38 CALIBERATION, CONFIGURATION & PROGRAMMING

The Meter shall be only factory calibrated, configured and programmed. No device, such as potentiometers shall be used which can result in change of calibration at site. The above activities shall not be possible at site through the use of user software or any such means. It shall, however, be possible to check the accuracy in the field by means of the test output. No setting points / setting registers etc. shall be provided for adjustment of measurement errors. Once finalised, the meter constants shall be freezed and it shall not be possible by the manufacturer or the user to alter the meter constants either at factory or at site.

6.39 GPRS CONNECTIVITY SCOPE

6.39.1 MSEDCL will provide VPN based SIM cards under Network Bandwidth Service Provider (NBSP) umbrella contract. Presently, following service providers are participated under umbrella contract.

Vodafone, Airtel, Idea, Tata.

6.39.2 The cost of SIM card & recurring monthly charges shall be borne by MSEDCL. The bidder has to decide location wise service provider and inform the service provider wise SIM requirement to MSEDCL.

6.39.3 The bidder must provide at the time of commissioning all technical documentation and manuals for all the equipments so that if required, a third party is also able to maintain them.

6.39.4 Configuration of all meters / AMR devices installed in MSEDCL MDAS s/w for establishing the network using IP addresses so as to enable their monitoring through the system.

7.00 TOD TIMINGS

The meter shall be capable of registering the time-of-day energy and maximum demand.

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable.

At present the time zones shall be programmed as below.

Zone "A" : 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs

Zone "B" : 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs

Zone "C" : 09=00 Hrs. to 12=00 Hrs

Zone "D" : 18=00 Hrs. to 22=00 Hrs.

8.00 MAXIMUM DEMAND INTEGRATION PERIOD

The maximum demand integration period shall be set at 30 minutes with block window method.

9.00 MD RESET

It shall be possible to reset MD by the following options:

a) Communication driven reset through hand held terminal (HHU).

b) Automatic reset at the end of certain predefined period (say, end of the month) or auto reset MD at 24:00 hrs at the end of each billing cycle.

The auto reset option shall be programmable for any date and time as per requirement.

No push button shall be provided for MD reset.

10.00 TAMPER AND FRAUD MONITORING FEATURES

10.01 ANTI TAMPER FEATURES

The meter shall detect and correctly register energy only in forward direction under following tamper conditions:

(i) Change of phase sequence: The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(ii) The three-phase meter shall continue to work even without neutral.

(iii) The three-phase meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(iv) Visual indication shall be provided to safeguard against wrong connections to the meter.

(v) If a consumer tries to steal power by disconnecting the voltage supply of one or two phases of the meter externally or by tampering so that no voltage or partial voltage (< 50% of Vref) is

available to voltage circuit of meter & current is flowing in that phase, the meter shall record energy at Vref, current available in these phases & UPF.

(vi) The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

(vii) Meter shall also be immune for tamper by application of remote loop induction device (jammer).

(viii) The meter shall not get affected by any remote device. When meter is subjected to approx. 35 KV abnormal high voltage / frequency burst and remote loop induction device (jammer), it shall not hang and in case if it hangs once, it shall remain hanged permanently.

The bidder shall furnish detailed explanation as to how the meter is able to detect / protect recording the above tamper and fraud features with sketches and phaser diagram. Additional features, if any, in the meter may also be clearly indicated.

10.02 TAMPER EVENTS

10.02.1 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS.

10.02.2 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh, power factor, event code, date & time etc. listed in Table 32 to 37 of IS: 15959 / 2011.

10.02.3 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter.

10.02.4 Tamper details shall be retrieved by authorized personnel through either of the following:

i) HHU.

ii) Remote access through suitable communication network.

10.02.5 Minimum 200 numbers of events (occurrences & restoration with date & time) shall be available in the meter memory. The recording of abnormal events shall be on FIFO basis. The unrestored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months).

10.02.6 All the information of data shall be made available in simple & easy to understand format.

10.02.7 The threshold values for various tampers are as below.

Sr. No.	**Description**	**Occurrence (With Occ. Time 5 min.)**	**Restoration (With Rest. Time 5 min.)**
1.	PT link Missing (Missing potential)	< 50% of Vref and current in that phase is > 1% Ib	> 50 % of Vref
2.	Over voltage in any phase	> 115 % of Vref	< 115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance	Vmax - Vmin > 10 % Vmax	Vmax - Vmin < 10 % Vmax
5.	Current Unbalance (Diff. of phase currents)	> 30 % Iref* for 15 min	< 30 % Iref* for 15 min
6.	Over Current in any Phase	> 120 % I_{max}	< 120 % I_{max}
7.	Influence of permanent magnet or AC / DC electromagnet / permanent magnet	Minimum 10 seconds	1 minute after removal
8.	Neutral Disturbance	--	--
9.	Power failure	Immediate	Immediate
10.	Very Low PF	--	--
11.	Current Bypass	Bypass current >50% of Iref	Bypass current <30% of Iref
* Higher of 3 phase currents shall be taken as reference for this			

purpose.

11.00 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc as per details given in the table below and IS: 15959 / 2011.

b) Block Load Profile Parameters such as kVAh / kWh / kVArh (lag / lead) / Maximum Demand (MD) in kW / kVA / power factor / phase and line voltages / currents etc. as per details given in the table below and IS: 15959 / 2011.

c) Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh, etc. as per details given in the table below and IS: 15959 / 2011.

In addition to above the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters (Table 30, 31 32, 33, 34, 35, 36, 37 & 39 respectively) of IS: 15959 / 2011.

Detail of category wise parameters requirement suitable for

LT consumer metering is given in following tables of IS: 15959 / 2011.

Category C2	Parameter group	Annexure Table No.
LT consumer Energy Meters	Instantaneous parameters	27
	Block Load Profile parameters	28
	Billing Profile Parameters	29
	Name Plate details	30
	Programmable Parameters	31
	Event Conditions	32 to 37

All logging parameters for each of the event condition for 3 Φ / 4W	Capture parameters for event (Event Log Profile)	39

12.00 DISPLAY OF MEASURED VALUES

12.01 DISPLAY INDICATORS

The supply indication & calibration (pulse indication) indication shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the meter.

12.02 The display shall be permanently backlit Liquid Crystal Display LCD with wide viewing angle for clear visibility of the display of the meter reading & shall be visible from the front of the meter. Large viewing area with large display icons is preferred.

12.03 LCD shall be suitable for temperature withstand of 70^0 C.

12.04 Adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

12.05 The display shall be electronic and when the meter is not energized, the electronic display need not be visible.

12.06 The display shall not be affected by electrical and magnetic disturbances.

12.07 Dot-Matrix type LCD display is not acceptable.

12.08 The meter shall make use of non-volatile memory capable of storing and retaining all the data required to be stored, without the help of any power source or battery back up and shall have a minimum retention time of 10 years under un-powered condition.

12.09 The accuracy of display parameters for all parameters shall be matching with the accuracy class of meter as per IS.

12.10 MINIMUM CHARACTER SIZE

(a) The meter shall have 7 digits parameter identifier,

(b) The height of the display characters for the principal parameters values shall not be less than 5 mm. The size of digit shall be minimum 10x5 mm.

12.11 The decimal units upto 2 digits shall not be displayed in auto scroll mode. However it shall be displayed in push button mode for high-resolution display for testing.

12.12 In case of multiple values presented by single display, it shall be possible to display the contents of all relevant memories. When

displaying the memory, the identification of each parameter applied shall be possible. The principle unit for measured values shall be the kilowatt-hour (kWh) for active energy, kVArh for reactive energy & kVAh for apparent energy.

12.13 The display of various parameters shall be scrolling one after another. The display shall have ON time of at least 10 seconds for each measured value.

12.14 The meter shall be pre-programmed for following details.

(a) MD Integration Period: 30 Minutes.

(b) The meter shall Auto reset kVAMD at 24.00 Hrs. of last day of the month and this value shall be stored in the memory along with the cumulative kWh, kVAh, kVArh (lag) & kVArh (lead) readings.

(c) No reset push button shall be provided.

(d) Average power factor with 2 decimal digits shall be displayed.

(e) The array of data to be retained inside the meter memory shall be for the last 60 days for a capture period of 30 minutes. The load survey data shall be first in first out basis (FIFO).

12.15 There shall be two display modes on the meter – (1) The Default Display (Auto scrolling mode) and (2) the Alternate Display Mode (On Demand Mode or Push Button Mode

12.16 The Default Display (Auto scrolling mode) shall switch to Alternate Display (On Demand Display Mode) after pressing the push button continuously for 5 seconds.

12.17 The meter display shall return to Default Display Mode if the "On Demand" Push Button is not operated for 15 sec.

12.18 Auto display cycling push button is required with persistence time of 10 Seconds.

12.19 MINIMUM DISPLAY CAPABILITY (MEASURING PARAMETERS)

The sequence of display of various instantaneous parameters in Default Display Mode (Auto Scroll Mode) & Alternate Display Mode (On Demand Mode) shall be as per table 27 & 29 (except 8 & 9) of Annex E of IS: 15959 / 2011 in the sequence as below.

Display other than specified below shall be blocked.

(A) DEFAULT DISPLAY MODE (AUTO SCROLL MODE)

The following parameters shall be available in Default Display Mode (Auto Scroll Mode). The scroll period for auto scroll shall be 10 secs.

Default Display Mode (Auto Scroll) (Scrolling Time 10 Secs.)	
1.	LCD Test
2.	Real Time Clock – Date & Time
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh - Lag
9.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
10.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
11.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
12.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)
13.	Cumulative Energy –kVArh - Lead
14.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
15.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
16.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
17.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)
18.	Cumulative Energy – kVAh
19.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
20.	Cumulative Energy – kVAh - TOD Zone B (TZ2)
21.	Cumulative Energy – kVAh - TOD Zone C (TZ3)

22.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
23.	Current MD – kVA with occurance date & time
24.	MD - kVA – TOD Zone A (TZ1) with occurance date & time
25.	MD - kVA – TOD Zone B (TZ2) with occurance date & time
26.	MD - kVA – TOD Zone C (TZ3) with occurance date & time
27.	MD - kVA – TOD Zone D (TZ4) with occurance date & time
28.	Number of MD – kVA reset
29.	Rising MD with elapsed time
30.	Three Phase Power Factor – PF
31.	Cumulative Tamper Count
32.	Meter Cover Opening – Occurance with date and time.

(B) ALTERNATE DISPLAY MODE (ON DEMAND DISPLAY MODE) THROUGH PUSH BUTTON

The following parameters shall be available in Alternate Display (On demand Display Mode).

The display of these parameters shall be continuously scrolling one after another through push button. Display parameters shall move forward if button pressed prior to the programmed time for display of each parameter.

Alternate Display (On – Demand Display) (Push Button mode) (Scrolling Time 6 Secs.)	
1.	Last date & time of MD - kVA reset
2.	Current – I_R
3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_R

6.	Voltage – V_Y
7.	Voltage – V_B
8.	Signed Power Factor – R Phase
9.	Signed Power Factor – Y Phase
10.	Signed Power Factor – B Phase
11.	Frequency
12.	High resolution kWh (for calibration)
13.	High resolution kVArh Lag(for calibration)
14.	High resolution kVArh Lead(for calibration)
15.	High resolution kVAh (for calibration)
16.	Running Demand kVA (for calibration)
17.	M1 MD - kVA – TOD Zone A (TZ1) with occurance date & time
18.	M1 MD - kVA – TOD Zone B (TZ2) with occurance date & time
19.	M1 MD - kVA – TOD Zone C (TZ3) with occurance date & time
20.	M1 MD - kVA – TOD Zone D (TZ4) with occurance date & time
21.	M2 MD - kVA – TOD Zone A (TZ1) with occurance date & time
22.	M2 MD - kVA – TOD Zone B (TZ2) with occurance date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurance date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurance date & time
25.	Last Tamper Event with date and time.

Note:

(1) Other kVA MD values shall be available in reset backup data for 12 months.

(2) The meter display shall return to Default Display Mode if the "On Demand Push Button" is not operated for 15 sec.

(3) The meter shall display the tamper meter cover open with date & time in

auto scroll mode along with other parameters

13.00 BILLING DATA, BILLING HISTORY, LOAD SURVEY & TAMPER DATA

13.01 BILLING DATA

The billing data shall be as per table 29 of Annex E of IS: 15959 / 2011 for category C2 and is summarized as below.

Sr. No.	Parameters
1.	Billing Date
2.	System Power Factor for Billing Period
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh – Lag
9.	Cumulative Energy – kVArh – Lead
10.	Cumulative Energy – kVAh
11.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
12.	Cumulative Energy – kVAh – TOD Zone B (TZ2)
13.	Cumulative Energy – kVAh – TOD Zone C (TZ3)
14.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
15.	MD – kVA with occurance date & time
16.	MD – kVA – TOD Zone A (TZ1) with occurance date & time
17.	MD – kVA – TOD Zone B (TZ2) with occurance date & time
18.	MD – kVA – TOD Zone C (TZ3) with occurance date & time

19.	MD – kVA – TOD Zone D (TZ4) with occurance date & time
20.	MD – kW occurance date & time
21.	MD – kW – TOD Zone A (TZ1) with occurance date & time
22.	MD – kW – TOD Zone B (TZ2) with occurance date & time
23.	MD – kW – TOD Zone C (TZ3) with occurance date & time
24.	MD – kW – TOD Zone D (TZ4) with occurance date & time

13.02 BILLING HISTORY

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 12 months.

13.03 LOAD SURVEY PARAMETERS

The array of data to be retained inside the meter memory shall be for the last 60 days for a capture period of 30 minutes. The capture period for load survey data should be configurable. 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.

(1)	Real Time Clock – Date and Time
(2)	Current - I_R
(3)	Current – I_Y
(4)	Current – I_B
(5)	Voltage – V_{RN}

(6)	Voltage – V_{YN}
(7)	Voltage – V_{BN}
(8)	Block Energy – kWh
(9)	Block Energy – kVArh – lag
(10)	Block Energy – kVArh – lead
(11)	Block Energy – kVAh

The above billing data, TOD register's data, load survey data, tamper information and instantaneous parameters data shall all be retrievable through RS-232 port through a common meter reading instrument and shall be transferred (downloaded) to a PC with Windows based software to get complete details in numerical and/or graphic form. The necessary base computer software (BCS) for this purpose shall be provided by the supplier with complete details.

14.00 DEMONSTRATION

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

15.00 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS: 13779 / 1999 (amended upto date) and CBIP Tech. Report 325. The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 13779 / 1999 (amended upto date). In case of conflict, the priority shall be as per clause no. 3.00 of this specification.

16.00 HAND HELD UNIT (HHU)- OPTIONAL

16.01 To enable local reading of meters data, a DLMS (Device Language Message Specification) compliant HHU shall be provided.

16.02 The HHU shall be as per specification given in Annex J of IS: 15959 / 2011.

16.03 It shall be compatible to the DLMS compliant energy meters that are to be procured / supplied on the basis of this specification.

16.04 The HHU shall be supplied by the meter manufacturer along with the meter free of cost in the ratio of one for each 250 Nos. meters supplied including user manual and a set of direct communication cords for data downloading to the Laptop or PC for each HHU.

16.05 There shall be a provision for auto power save on HHU, which shall force the instrument in the power saving mode in case of no-activity within 5 minutes. The data shall not be lost in the event the batteries are drained or removed from the HHU.

16.06 The HHU shall have a memory capacity of 512 MB SRAM (Static RAM) with battery backup & upgradeable and BIOS / OS on FLASH / EEPROM Memory of 256 KB (RAM-512 MB, FLASH-2GB, SD Card- 8GB with USB facility)

16.07 The manufacturer / supplier shall modify the compatibility of HHU with the meter and the base computer system due to any change in language or any other reasons at their own cost within guarantee period.

16.08 The HHU shall be type tested for (a) Tests of Mechanical requirement such as Free fall test, Shock Test, Vibration test, (b) Tests of Climatic influences such as Tests of Protection against Penetration of Dust and Water (IP 6X), Dry Heat test, Cold Test, Damp Heat Cyclic Test, (c) Tests for Electromagnetic Compatibility (EMC), (d) Test of Immunity to Electromagnetic HF Fields and (e) Radio Interference Measurement.

16.09 The equipments offered shall be fully type tested at approved laboratory by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per relevant standards within last 5 years from the date of opening of tender & the type test reports shall be enclosed with the offer.

17.00 COMPUTER SOFTWARE

17.01 For efficient and speedy recovery of data downloaded through HHU on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier.

17.02 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall generate the reports in pdf or excel format.

17.03 The Base Computer Software shall be "Windows" based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as HHU by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS.

17.04 The total time taken for downloading Billing, Tamper and Load Survey Data for 60 days shall be less than or equal to 8 minutes.

17.05 Downloading time of only Billing data shall be less than or equal to 20 secs.

17.06 It shall be possible to upload the HHU data to any PC having HHU software. A consumer based data uploading facility is required so that HHU shall upload data only in that PC which has the concerned consumers` data. The consumer code + meter no. shall be the key for creating consumers` files or overwriting consumers` files in PC. The software system files and data files shall be stored in different directories.

17.07 The BCS software shall create one single file for the uploaded data, e.g. if HHU contains the meter readings of, say, 2,000 consumer meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading in XML file as per MIOS for individual meter reading.

17.08 Meter manufacturers should also need to submit Convert API (API3) as per MIOS universal standard along with Base Computer System free of cost. This API should capable of converting both data i.e. AMR data collected from Read API (API1) and MRI data collected from CMRI.

17.09 Also there shall be a provision to give filenames while creating the file.

17.10 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3.

17.11 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

17.12 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHU.

17.13 The software provided on laptop or PC shall be compatible to read the data from USB drive and for that purpose a sample cable (1 No.) shall be provided with USB termination.

USB being the de-facto standard, this is the requirement.

17.14 MSEDCL is procuring large quantity of meters. As such manufacturer

have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing & Control Cell / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

18.00 METERING PROTOCOL

As per Category C2 of IS: 15959 / 2011.

19.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS

The connection diagram of the meter shall be clearly shown on inside portion of terminal cover & shall be of permanent nature.

Meter terminals shall also be marked & this marking shall appear in the above diagram.

20.00 INSTALLATION CHECK

While installing the meter, it shall be possible to check the correctness of the connection to the meters and their polarity from the functioning of the meter with the help of HHU under load condition. The phase sequence and phased association of voltage and current can be checked with the help of HHU.

21.00 NAME PLATE AND MARKING OF METERS

Meter shall have a nameplate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards.

Meter Serial Number shall be Bar Coded along with numeric number. The manufacturer's meter constant shall be marked on the nameplate. The size of bar coded number shall not be less than 35x5 mm. Meter serial number & bar code on sticker will not be allowed. In addition to the requirement as per IS, following shall be marked on the nameplate.

(i) Purchase order No & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Period as per tender document

(v) ISI mark

(vi) Category of Meter: **Category C2 – IS: 15959 / 2011**. The

character height of the same shall be minimum 3 mm in capital letters.

22.00 MOUNTING ARRANGEMENT

Suitable wall mounting arrangement for the complete meter unit shall be provided such that the mounting bolts shall be operated/ opened or accessible only after operation of a set of seal.

Proper locking arrangement shall be provided to protect from unauthorised removal of meter from its mount.

23.00 TESTS

23.01 TYPE TESTS

The meter offered shall have successfully passed all type tests described in the IS: 13779 /1999 (amended up to date), external AC / DC magnetic influence tests as per CBIP Tech Report 325 with latest amendments.

The Type Test Reports shall clearly indicate the constructional features of the type-tested meter. The type test reports of the meter shall be same as the meter offered. Separate type Test Reports for each offered type of meter shall be submitted.

All the Type Tests shall be carried out from Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the meter meets the requirements of specification.

Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The Type Test Certificate as per IS: 13779 / 1999 shall be submitted along with the offer. The Type Test certificate carried out during last five years shall be valid.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix-C of Latest – standardization of AC static electrical energy meters – CBIP publication No. - 325/ NPL / CQAL/ ERTL / ERDA at the sole discretion of the Purchaser. The supplier has no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier. It shall be the responsibility of the supplier to arrange such tests and Purchaser shall be informed of the date and time of conduction of tests well in

advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

23.02 The meter shall pass all the acceptance and routine tests as laid down in IS: 13779 / 1999 (amended up to date) and also additional acceptance tests as prescribed in this specification. (3 to 8 meters from a lot more than 1,000 will be sealed randomly in the factory and will be tested for tamper events).

23.03 ADDITIONAL ACCEPTANCE TESTS

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 13779 / 1999 (amended up to date).

(a) **Other Acceptance Tests**

i. The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage / problems.

ii. Meter shall be tested for tamper conditions as stated in this specification.

iii. Glow wire testing for polycarbonate body.

iv. Power consumption tests shall be carried out.

v. The meter shall comply all the tests for external AC / DC magnetic field as per CBIP Tech Report 325 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping. After removal of magnet, meter shall be subjected to accuracy test as per IS: 13779 /1999 (amended up to date). No deviation in error is allowed in the class index as per IS: 13779 /1999 (amended up to date) & this specification.

vi. The meter shall withstand impulse voltage at 10 kV.

The test 23.03 (a) (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 23.03 (a) (v) & (vi) shall be carried out on one sample from first lot as per procedure laid down in IS 13779 / 1999

(amended up to date) and CBIP Tech Report 325 (with latest amendments) in NABL LAB. The test report shall be got approved from the Chief Engineer, MSEDCL, Testing & Quaity Control Cell, 5th Floor, Prakashgad, Bandra (East), Mumbai – 400 051 before commencement of supply.

Likewise the type test certificate for the meter protocol used in the meter as per Category C2 of IS: 15959 / 2011 shall be got approved from the Chief Engineer, MSEDCL, Testing & Quaity Control Cell, 5th Floor, Prakashgad, Bandra (East), Mumbai – 400 051 before commencement of supply.

(b) **Limits of error**

(i) Limits of variation in percentage error due to change in voltage shall not exceed the values given in the following table:

SN	Influence quantities	Value of current (Balanced, unless otherwise stated)	Power factor	Limits of variation in % error for class 1 meter
(a)	Voltage variation – 15% to +10%	Ib Ib	1 0.5 lag	0.7 1.0
(b)	Voltage variation – 40%, + 20% & + 10%	Ib Ib	1 0.5 lag	1.1 1.5

(ii) The meter shall be tested at (-) 15% and at (-) 40% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.

For other influence quantities like frequency variation, voltage unbalance etc. the limits of variation in percentage error will be as per IS: 13779 / 1999 (amended up to date).

24.00 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of Meters in schedule 'A'.

The offers without the details in Schedule `A' shall stand rejected.

25.00 PRE DESPATCH INSPECTIONS

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL's representative / Engineer attending the above testing will carry out testing on suitable number of meter as per sampling procedure laid down in IS: 13779 / 1999 (amended up to date) and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch. The meter shall be sealed after inspection at works.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer, Inspection Wing.

26.00 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing)

For carrying out Random Sample Testing (RST), the sample meters shall be drawn from any one of the stores against inspected lot and same shall be tested at any of the Testing and Quality Assurance Units at Aurangabad, Bhandup, Kolhapur, Nagpur, Nashik and Pune. Sample meters shall be drawn as per Annex H (Recommended Sampling Plan) of IS: 13779 / 1999 (amended upto date). Sample meters shall be tested by MSEDCL Testing Engineer in presence of supplier's representative jointly for (i) Starting Current, (ii) Limits of error, (iii) Repeatability of error, (iv) No Load Test as per IS: 13779 / 1999 (amended upto date) & (v) tamper conditions as per technical specifications and (vi) Data downloading time as per specifications.

The 5 days advanced intimation shall be given to the supplier and if the supplier fails to attend the joint inspection on the date informed, the testing shall be carried out by our Testing Engineer in absence of supplier's representative.

If the meters failed in above Random Sample Testing, the lot shall be rejected

27.00 GUARANTEE

The meter, Modem etc. shall be guaranteed as per tender document.

28.00 PACKING

28.01 The meters shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

28.02 The following information shall be furnished with the consignment:

- Name of the consignee
- Details of consignment
- Destination
- Total weight of the consignment
- Sign showing upper / lower side of the crate
- Sign showing fragility of the material
- Handling and unpacking instructions
- Bill of Materials indicating contents of each package & spare material

29.00 QUALITY CONTROL

29.01 The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification.

The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

29.02 The meters supplied shall give service for a long period with out drifting from the original calibration & performance must be near to zero percent failure.

30.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING

30.01 Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through

Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block / stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

The manufacturer shall submit the list of plant and machinery along with the offer.

Meter shall be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process.

Further, the Bidder shall own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities.

The calibration of meter shall be done in-house.

30.02 MANUFACTURING ACTIVITIES

Quality shall be ensured at the following stages.

30.02.1 At PCB manufacturing stage, each Board shall be subjected to computerized bare board testing.

30.02.2 At insertion stage, all components shall under go computerized testing for conforming to design parameter and orientation.

30.02.3 Complete assembled and soldered PCB shall under go functional testing using Automatic Test Equipments (ATEs).

30.02.4 Prior to final testing and calibration, all meter shall be subjected to ageing test ('burn-in' test process) (i.e. Meter will be kept in ovens for 72 hours at 55 deg C temperature & at full load current.

After 72 hours meter shall work satisfactory) to eliminate infant mortality.

30.02.5 The bidders shall submit the list of all imported and indigenous components separately used in meter along with the offer.

30.02.6 Bought out items:

A detailed list of bought out items, which are used in the manufacturing of the meter, shall be furnished indicating the name of firms from whom these items are procured.

The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

30.02.7 List of Plant and Machinery used for production of energy meter:

SN	**List of Plant and Machinery used for Energy meter Production**	
1	Fully automatic testing Bench with ICT for testing link less meter	Routine Testing and Calibration of Meter
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meter
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meter Class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meter
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs

13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	Resistance network and HMC manufacturing
17	Laser Trimming Machines	Trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meter
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meter
30	Short term over Current testing setup	Type testing of Meter
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meter
33	Composite Environmental testing chambers	Type testing of Meter

31.00 QUALITY ASSURANCE PLAN

31.01 The tenderer shall invariably furnish QAP as specified in Annexure I along with his offer. The QAP shall be adopted by him in the process of manufacturing.

31.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP

32.00 COMPONENT SPECIFICATION

As per Annexure - II enclosed.

33.00 SCHEDULES

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'A' …. Guaranteed and technical particulars.

34.00 DOCUMENTATION

a. All drawings shall conform to International Standards Organisation (ISO "A" series of drawing sheet / India Standards Specifications IS: 656. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in S.I. Units.

b. List of drawings and documents:

   The bidder shall furnish the following along with bid

   (i) Two sets of drawing clearly indicating the general arrangements, fitting details, electrical connections etc.

   (ii) Technical leaflets (user's manual) giving operating instructions.

   (iii) Three copies of dimensional drawings of the quoted item.

c. The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication works in connection with the equipment prior to the approval of the drawing shall be at the supplier's risk.

d. Approval of drawings by purchaser shall not absolve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revision of application standards, rules and codes of practices.

The equipment shall conform in all respect to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject the materials which, in his judgement, is not fully in accordance therewith.

e. The successful Bidder shall, within 2 weeks of notification of award of contract, submit three sets of final versions of all the drawings as stipulated in the purchase order for purchaser's approval. The purchaser shall communicate his comments / approval on the drawings to the supplier within two weeks.

   The supplier shall, if necessary, modify the drawings and resubmit three copies of the modified drawings for approval. The supplier shall within two weeks, submit 10 prints and two good quality report copies of the approved drawings for purchaser's use.

f. Ten sets of operating manuals / technical leaflets shall be supplied to each consignee for the first instance of supply.

g. One set of routine test certificates shall accompany each dispatch consignment.

h. The acceptance test certificates in case of pre-dispatch inspection or routine test certificates in cases where inspection is waived shall be got approved by the purchaser.

35.00 GENERAL

a) Principle of operation of the meter, outlining the methods and stages of computation of various parameters starting from input voltage and current signals including the sampling rate, if applicable, shall be furnished by the bidder.

b) The bidder shall indicate the method adopted to transform the voltage and current to the desired low values with explanation on devices used such as CT / shunt, potential divider as to how they can be considered superior in maintaining ratio and phase angle for variation of influencing quantities during its service period.

c) The bidder shall furnish details of memory used in the meter.

ANNEXURE – I

QUALITY ASSURANCE PLAN

A) The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub - suppliers for the raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of Bidder's representative, copies of test certificates,

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories,

iii) List of manufacturing facilities available,

iv) Level of automation achieved and list of areas where manual processing exists,

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections,

vi) List of testing equipments available with the bidder for final testing of equipment specified and test plan limitation, if any, vis-à-vis, the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i) List of raw materials as well as bought out accessories and the names of sub - suppliers selected from those furnished along with offers.

ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following:

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice, then the work may proceed.

D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality

Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization.

- > The duties and responsibilities assigned to staff ensuring quality of work.
- > The system for purchasing taking delivery and verification of material.
- > The system for ensuring quality workmanship.
- > The system for retention of records.
- > The arrangement for contractor's internal auditing.
- > A list of administration and work procedures required to achieve and verify contractor's quality requirements.

  These procedures shall be made readily available to the project manager for inspection on request.

ii) Quality Plans:

- > An outline of the proposed work and programme sequence.
- > The structure of the contractor's organization for the contract.
- > The duties and responsibilities assigned to staff ensuring quality of work.
- > Hold and notification points.
- > Submission of engineering documents required by the specification.
- > The inspection of materials and components on receipt.
- > Reference to contractor's work procedures appropriate to each activity.
- > Inspection during fabrication / construction.
- > Final inspection and test.

ANNEXURE - II

COMPONENT SPECIFICATION

The make/grade and the range of the components should be from the following list makes or equivalent reputed makes

SN	Component Function	Requirement	Makes & Origin
1.	Current	The Meters shall be with	

	Transformers	the current transformers as measuring elements. The current transformer shall withstand for the clauses under 5 & 9 of IS: 13779 / 1999	
2.	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	**USA:** Teridian, Analog Devices, Cyrus Logic, Atmel, Philips, Dallas, ST, Motorola, Texas Instruments, Maxim, Freescale, National Semiconductor, Onsemiconductors. **Germany**: Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria**: AMS. **Holland:** Philips (N X P) **Taiwan**: Prolific
3.	Memory chips	Memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. Meter shall have nonvolatile memory (NVM). No other type of memory shall be used for data recording and	**USA:** Teridian, Atmel, Philips, ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron. **Japan**: Hitachi,

		programming. (The life of the NVM is highest). There shall be security isolation between metering circuit, communication circuit, and power circuit.	Renasas. **Germany**: Siemens
4.	Display modules	The display modules shall be well protected from the external UV radiations. The display visibility shall be sufficient to read the Meter mounted at a height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for viewing angle). The construction of the modules shall be such that the displayed quantity shall not disturb with the life of display (PIN Type). It shall be Tran-reflective HTN or STN type industrial grade with extended temperature range.	**Singapore**: Bonafied Technologies, Displaytech, E-smart **Korea:** Advantek, Jebon, Union Display Inc. **Hong Kong**: Genda **China:** Success, Truly, Tianma. **Japan:** Hitachi, Sony, L & G. **Malaysia:** Crystal Clear Technology.
5.	Communication Modules	Communication modules shall be compatible for the two ports (one for IR port for communication with meter reading instruments (HHU) & the other for the hardwired RS-232 port to communicate with various modems for AMR)	**USA:** Agilent, HP, Fairchild, National Semiconductors, Optonica. **Holland:** Philips. **Korea:** Phillips. **Japan:** Hitachi. **Taiwan:** Ligitek
6.	Power supply	The power supply shall be	SMPS Type

		with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections. It shall not also be affected by magnet	
7.	Electronic Components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** Atmel, National Semiconductors, BC Component, Philips, Texas Instruments, Analog Devices. ST, Onsemiconductors, Maxim, Muruta, Kemet, Freescale, AVX, Intersil, Raltron, Fox, Fairchild, Agilent, Abracon, Diode Inc., Honeywell, Sipex Power Integration, Roham. **Japan**: Hitachi, Oki, AVZ, Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung. **India:** RMC, VEPL, KELTRON, Incap, PEC, Cermet, Gujarat Polyavx,

			Prismatic, MFR Electronic Components Pvt. Ltd, CTR. **Korea:** Samsung **Japan:** Panasonic **Germany**: Kemet, Vishay, Epcos, Diotech, Infineon. **Taiwan**: Yageo
8.	Mechanical parts	The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
9.	Battery	Maintenance free battery (Ni-mh or Li-ion) of long life of 10 years. Only non-rechargeable battery shall be used for RTC as well as display in absence of Power since the life & Reliability of these are better than the rechargeable batteries.	**USA**: Varta, Tedirun, Sanyo or National, Maxell, Renata. **Japan**: Panasonic, Sony. **France**: Saft. **Korea**: Tekcell. **Germany**: Varta.
10	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standard.	**USA**: ST, Teridian, Philips, Dallas, Atmel, Motorola, Microchip. **Japan**: NEC, Oki, Epson, Mitubishi.

11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

ANNEXURE – III

MSEDCL DEFINED OBIS CODES FOR PARAMETERS NOT PRESENT IN IS 15959/2011

SR. NO.	PARAMETERS	OBIS Code						Interface Class No./ Attribute
		A	B	C	D	E	F	

1.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)	1	0	5	8	1	255	3/2
2.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)	1	0	5	8	2	255	3/2
3.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)	1	0	5	8	3	255	3/2
4.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)	1	0	5	8	4	255	3/2
5.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)	1	0	8	8	1	255	3/2
6.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)	1	0	8	8	2	255	3/2
7.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)	1	0	8	8	3	255	3/2
8.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)	1	0	8	8	4	255	3/2

SCHEDULE 'A'

GUARANTEED TECHNICAL PARAMETERS

ITEM: LT AC THREE PHASE FOUR WIRE 40 – 200 AMPS FULLY STATIC AMR COMPATIBLE TOD TRI – VECTOR ENERGY METER WITH IN – BUILT CT MODEM AND RS-232 PORT

SR. NO.	PARAMETERS	GTP VALUES
1.0	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TO BE FILLED BY MANUFACTURER
2.0	MAKE & TYPE	TO BE FILLED BY MANUFACTURER
3.0	APPLICABLE STANDARD	IS 13779, IS 15959, CBIP 325
4.0	METER BEARS ISI MARK	YES
5.0	ACCURACY CLASS 1.00	YES
6.0	CURRENT RATING	40 – 200 AMPS
7.0	RATED BASIC CURRENT (IB)	40 AMPS PER PHASE
8.0	STARTING CURRENT	0.2% OF IB.
9.0	SHORT TIME CURRENT	AS PER IS 13779 / 1999.
10.0	RATED VOLTAGE	3X240 VOLTS PHASE TO NEUTRAL
11.0	VOLTAGE RANGE	+ 20 % TO – 40 % OF RATED VOLTAGE.
12.0	SYSTEM EARTHING	SOLIDLY GROUNDED
13.0	POWER FACTOR	ZERO LAG TO UNITY TO ZERO

		LEAD TO UNITY
14.0	STANDARD REFERENCE TEMPERATURE FOR PERFORMANCE	27^0C
15.0	MEAN TEMPERATURE CO-EFFICIENT DOES NOT EXCEED	0.07%.
16.0	FREQUENCY RANGE	50 Hz ±5%
17.0	ACTIVE AND APPARENT POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT AT REFERENCE VOLTAGE, REFERENCE TEMPERATURE AND REFERENCE FREQUENCY	SHALL NOT EXCEED 2.0 W AND 10 VA
18.0	APPARENT POWER TAKEN BY EACH CURRENT CIRCUIT, AT BASIC CURRENT IB, REFERENCE FREQUENCY AND REFERENCE TEMPERATURE	SHALL NOT EXCEED 4 VA
19.0	METER DRAWS POWER FOR WORKING OF ELECTRONIC CIRCUIT FROM PHASE & NEUTRAL.	YES
20.0	KVA MD PROVIDED	YES
21.0	INTEGRATION PERIOD OF KVAMD	30 MINUTES WITH BLOCK METHOD
22.0	METER BASE & COVER IS MADE OUT OF TRANSPARENT / OPAQUE, UNBREAKABLE, HIGH GRADE, FIRE RESISTANT, HIGH IMPACT STRENGTH POLYCARBONATE MATERIAL.	YES
23.0	CONSTRUCTION OF THE METER IS SUCH AS TO PERMIT SEALING OF METER COVER, PIERCING SCREW COVER, ETC. INDEPENDENTLY TO ENSURE THAT INTERNAL PARTS ARE NOT ACCESSIBLE FOR TAMPERING WITHOUT BREAKING SEALS.	YES
24.0	POLYCARBONATE BODY OF METER CONFORMS TO	YES

	(a) IS: 11731 (FV-2 CATEGORY)	
25.0	(b) HEAT DEFLECTION TEST AS PER ISO 75,	YES
26.0	(c) GLOW WIRE TEST AS PER THE IS: 11000 (PART 2/SEC-1) 1984 OR IEC-60695-2-12,	YES
27.0	(d) BALL PRESSURE TEST AS PER IEC-60695-10-2	YES
28.0	(e) FLAMMABILITY TEST AS PER UL 94 OR AS PER IS: 11731 (PART-2) 1986.	YES
29.0	TYPE TEST CERTIFICATE OF ABOVE SUBMITTED ALONG WITH OFFER.	YES
30.0	TYPE TEST CERTIFICATE NO. & DATE OF ABOVE	TO BE FILLED BY MANUFACTURER
31.0	METER IS PROJECTION TYPE, DUST AND MOISTURE PROOF.	YES
32.0	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS.	YES
33.0	PROVISION IS MADE ON THE METER FOR AT LEAST TWO SEALS TO BE PUT BY UTILITY USER.	YES
34.0	METER CONFORMS TO IP 54 OF IS: 12063 / IEC: 529 FOR PROTECTION AGAINST INGRESS OF DUST, MOISTURE AND VERMIN'S.	YES
35.0	TYPE TEST CERTIFICATE OF IP 54 SUBMITTED ALONG WITH THE OFFER.	YES
36.0	TYPE TEST CERTIFICATE NO. AND DATE OF IP 54	TO BE FILLED BY MANUFACTURER
37.0	THICKNESS OF MATERIAL FOR METER COVER AND BASE IS MINIMUM 2 MM.	YES
38.0	METER HAS A CASE, WHICH CAN BE SEALED IN	YES

	SUCH A WAY THAT THE INTERNAL PARTS OF THE METER ARE NOT ACCESSIBLE UNLESS BODY IS BROKEN.	
39.0	MINIMUM THREE SETS OF SEALS, I.E. FOR PIERCING SCREWS, METER COVER AND THE FRONT DOOR ARE PROVIDED.	YES
40.0	ANY TEMPORARY DEFORMATION OF CASE DOES NOT EFFECT THE SATISFACTORY OPERATION OF THE METER.	YES
41.0	METER HAS FRONT-HINGED DOOR WITH SUITABLE SEALING ARRANGEMENT (SCREWS) AND TRANSPARENT WINDOW TO VIEW THE DISPLAY PARAMETERS.	YES
42.0	FRONT DOOR CAN BE SEALED INDEPENDENTLY OVER TERMINAL COVER.	YES
43.0	APPROACH TO READING BUTTON AND RS-232 PORT IS ONLY POSSIBLE AFTER OPENING THE FRONT COVER.	YES
44.0	METER HAS PROVISION TO PASS CONSUMER SERVICE CABLE DIRECTLY THROUGH METER FOR MEASUREMENT.	YES
45.0	PIERCING SCREWS ARE USED IN THE METER FOR VOLTAGE CONNECTION.	YES
46.0	METER IS SUITABLE TO ACCOMMODATE ALUMINIUM CABLE OF 200A CURRENT CARRYING CAPACITY.	YES
47.0	METER CONNECTION ARRANGEMENT IS SUCH THAT THERE IS NO NEED TO REMOVE INSULATION FOR CONNECTING CABLE FOR CURRENT MEASUREMENT	YES
48.0	METER DESIGN SUPPORTS THREAD THROUGH CONCEPT WHERE CONNECTING CABLE DIRECTLY PASSED THROUGH THE METER FOR MEASUREMENT.	YES

49.0	OFFERED METER DOES NOT HAVE PROVISION FOR METER TERMINAL CONNECTION AS WELL AS TERMINAL BLOCK.	YES
50.0	VOLTAGE CIRCUIT AND CURRENT CIRCUIT ARE SOLIDLY CONNECTED INSIDE THE METER BODY WITHOUT ANY LINK.	YES
51.0	A FIRM CONNECTION IS ESTABLISHED WITHIN METER CASE TO ENERGISE VOLTAGE / CURRENT CIRCUIT.	YES
52.0	PT PIERCING SCREW COVER FOR METER IS EXTENDED TYPE, WHICH CAN BE SEALED INDEPENDENTLY	YES
53.0	PT TERMINALS ARE NOT ACCESSIBLE WITHOUT REMOVING THE SEALS OF THE TERMINAL COVER WHEN ENERGY METER IS MOUNTED ON THE METER BOARD/ WALL.	YES
54.0	SUITABLE CONNECTOR WITH MULTIPLE PIERCING TEETH ARE PROVIDED FOR PT CONNECTION	YES
55.0	MINIMUM 3 TEETH PIERCE THE INSULATION OF THE CABLE	YES
56.0	METER HAS DURABLE AND SUBSTANTIALLY CONTINUOUS ENCLOSURE MADE OF WHOLLY INSULATING MATERIAL, INCLUDING THE TERMINAL COVER, WHICH ENVELOPS ALL METAL PARTS WITH THE EXCEPTION OF SMALL PARTS AND SHALL WITHSTAND AN INSULATION TEST AT 10 KV.	YES
57.0	SEALING ARRANGEMENT IS MADE WITH UNIDIRECTIONAL SCREWS WITH SINGLE HOLES	YES
58.0	SEALS ARE PROVIDED ON FRONT SIDE ONLY.	YES
59.0	ACCESS TO WORKING PART IS NOT POSSIBLE WITHOUT BREAKING THE SEALS.	YES

60.0	PROVISION OF AT LEAST 2 NOS. SEALS ON FRONT DOOR, 1 SEAL ON COMMUNICATION PORT, 2 SEALS ON PIERCING SCREW TERMINAL COVER IS MADE.	YES
61.0	MATERIAL OF PIERCING SCREW BLOCK DOES NOT DEFLECT UNDER HEATING AND FULFILL THE TESTS AS SPECIFIED IN 12.4 OF IS: 13779 / 1999 AMENDED UPTO DATE.	YES
62.0	PUSH BUTTON ARRANGEMENT PROVIDED AS PER SPECIFICATION	YES
63.0	OPERATION INDICATOR VISIBLE FROM THE FRONT & IN THE FORM OF BLINKING LED OR OTHER SIMILAR DEVICES LIKE BLINKING LCD IS PROVIDED.	YES
64.0	RESOLUTION OF TEST OUTPUT DEVICE IS SUFFICIENT TO ENABLE STARTING CURRENT TEST IN LESS THAN 10 MINUTES AND ACCURACY TEST AT LOWEST LOAD CAN BE COMPLETED WITH DESIRED ACCURACY WITHIN 5 MINUTES.	YES
65.0	PULSE RATE OF OUTPUT DEVICE WHICH PULSE / KWH AND PULSE / KVARH (METER CONSTANT) IS INDELIBLY PROVIDED ON NAMEPLATE.	YES
66.0	IT IS POSSIBLE TO CHECK THE ACCURACY OF ACTIVE ENERGY MEASUREMENT OF THE METER ON SITE BY MEANS OF LED OUTPUT OF OUTPUT DEVICE.	YES
67.0	METER ACCURACY IS NOT AFFECTED BY MAGNETIC FIELD (AC / DC / PERMANENT) ON ALL THE SIDES OF METER, I.E. FRONT, SIDES, TOP AND BOTTOM OF THE METER AS PER CBIP TECHNICAL REPORT 325	YES
68.0	THE METER ACCURACY SHALL NOT BE AFFECTED BY EXTERNAL AC / DC /	YES

	PERMANENT MAGNETIC FIELD AS PER CBIP TECHNICAL REPORT 325 WITH LATEST AMENDMENTS. IF THE METER GETS AFFECTED UNDER INFLUENCE OF ANY MAGNETIC FIELD (AC / DC / PERMANENT), THEN THE SAME SHALL BE RECORDED AS MAGNETIC TAMPER EVENT WITH DATE & TIME STAMPING AND THE METER SHALL RECORD ENERGY MAXIMUM VALUE CURRENT (IMAX) AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	
69.0	NON - RECHARGEABLE AND PRE-PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR CORRECTION, REAL TIME QUARTZ CLOCK IS USED IN THE METER FOR MAINTAINING TIME (IST) AND CALENDAR.	YES
70.0	MAXIMUM DRIFT OF RTC DOES NOT EXCEED +/- 300 SECONDS PER YEAR.	YES
71.0	CLOCK DAY / DATE SETTING AND SYNCHRONIZATION IS POSSIBLE ONLY THROUGH PASSWORD / KEY CODE COMMAND FROM METER TESTING WORK BENCH OR REMOTE SERVER	YES
72.0	RTC BATTERY & THE BATTERY FOR DISPLAY IN CASE OF POWER FAILURE ARE SEPARATE	YES
73.0	NON-SPECIFIED DISPLAY PARAMETERS IN THE METER ARE NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION	YES
74.0	COMPLETE METERING SYSTEM & MEASUREMENT IS NOT AFFECTED BY EXTERNAL ELECTROMAGNETIC INTERFERENCE	YES
75.0	METER KEEPS LOG IN ITS MEMORY FOR UNSATISFACTORY / NON -FUNCTIONING OF REAL TIME CLOCK BATTERY AND CAN BE DOWNLOADED FOR READING THROUGH RS-232	YES

	PORT TO READ IN BASE COMPUTER.	
76.0	METER HAS FACILITY TO READ DEFAULT DISPLAY PARAMETERS DURING POWER SUPPLY FAILURE.	YES
77.0	INTERNAL BATTERY PROVIDED	YES
78.0	DOWNLOADING OF BILLING DATA THROUGH HHU IS POSSIBLE IN POWER OUTAGE CONDITION.	YES
79.0	METER CAPABLE TO WITHSTAND PHASE-TO-PHASE VOLTAGE APPLIED BETWEEN PHASE TO NEUTRAL FOR 5 MINUTES	YES
80.0	METER RECORDS AND DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY	YES
81.0	METER DOES NOT STOP AND RECORDS CONSUMPTION ACCURATELY EVEN ON INJECTION OF DC VOLTAGE IN NEUTRAL	YES
82.0	35 KV SPARK DISCHARGE TEST CARRIED OUT	YES
83.0	WIRELESS PCB IS DESIGNED	YES
84.0	METER PROVIDED WITH A HARDWARE PORT COMPATIBLE WITH RS-232 SPECIFICATIONS FOR LOCAL DATA DOWNLOADING THROUGH A DLMS COMPLIANT HHU	YES
85.0	SEALING PROVISION IS MADE FOR RS-232 PORT	YES
86.0	BAUD RATE OF RS-232 PORT	9600 BPS
87.0	1 MTR LONG CABLE PROVIDED FOR DOWNLOADING DATA ON HHU OR LAPTOP FROM RS-232 PORT	YES
88.0	GSM (GPRS ENABLED) MODEM IS PROVIDED EMBEDDED IN THE METER BODY.	YES
89.0	MAKE OF CHIPSET USED FOR MODEM	TO BE FILLED BY

		MANUFACTURER
90.0	MODEM CAN BE CONNECTED SUCH THAT RS-232 PORT IS FREE FOR DATA DOWNLOADING THROUGH HHU.	YES
91.0	NON VOLATILE MEMORY OF MINIMUM RETENTION PERIOD OF 10 YEARS PROVIDED	YES
92.0	6 (SIX) TOD TIME ZONES ARE PROVIDED FOR ENERGY AND DEMAND	YES
93.0	METER IS CAPABLE OF REGISTERING THE TIME-OF-DAY ENERGY AND MAXIMUM DEMAND.	YES
94.0	THE MAXIMUM DEMAND INTEGRATION PERIOD SHALL BE SET AT 30 MINUTES.	YES
95.0	PROVISION OF MD RESET THROUGH HHU	YES
96.0	PROVISION OF MD RESET AT 24:00 HRS AT THE END OF EACH BILLING CYCLE OR AUTOMATIC RESET AT THE END OF CERTAIN PREDEFINED PERIOD (SAY, END OF THE MONTH). NO PUSH BUTTON SHALL BE PROVIDED FOR MD RESET.	YES
97.0	AUTO RESTTING OPTION OF MD IS PROGRAMMABLE FOR DAY / DATE AS PER REQUIREMENT	YES
98.0	ALL ANTI TAMPER FEATURES INCORPORATED IN THE METER AS PER SPECIFICATION	YES
99.0	METER DETECTS AND LOGS TAMPER EVENTS AS PER SPECIFICATION	YES
100.0	METER KEEPS RECORD OF MINIMUM 200 ABNORMAL EVENTS ON FIFO BASIS	YES
101.0	METER DISPLAYS SUPPLY INDICATION & CALIBRATION (PULSE INDICATION) PERMANENTLY BY LED / LCD	YES
102.0	PERMANENTLY BACKLIT LIQUID CRYSTAL	YES

	DISPLAY LCD WITH WIDE VIEWING ANGLE OF MINIMUM 45^{O}C TO 60^{O}C AND UP TO ONE-METER DISTANCE VISIBLE FROM THE FRONT OF THE METER IS PROVIDED.	
103.0	LCD IS DESIGNED SUITABLY TO WITHSTAND TEMPERATURE OF 80^{O}C (STORAGE) & 65^{O}C (OPERATION).	YES
104.0	DISPLAY DOES NOT GET AFFECTED BY ELECTRICAL AND MAGNETIC DISTURBANCES	YES
105.0	METER HAS 7 DIGITS PARAMETER IDENTIFIER	YES
106.0	HEIGHT OF DISPLAY CHARACTERS FOR PRINCIPAL PARAMETERS VALUES IS NOT LESS THAN 5 MM.	NOT LESS THAN 5 MM
107.0	SIZE OF DIGITS	TO BE FILLED BY MANUFACTURER
108.0	AUTO DISPLAY CYCLING PUSH BUTTON IS PROVIDED WITH PERSISTENCE TIME OF	10 SECONDS.
109.0	DEFAULT DISPLAY MODE SWITCHES TO ALTERNATE DISPLAY MODE AFTER PRESSING THE PUSH BUTTON CONTINUOUSLY FOR 5 SECONDS.	YES
110.0	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF THE “ON DEMAND” PUSH BUTTON IS NOT OPERATED FOR 15 SEC.	YES
111.0	METER IS CAPABLE OF MEASURING AND DISPLAYING THE ELECTRICAL QUANTITIES WITHIN SPECIFIED ACCURACY LIMITS FOR POLYPHASE BALANCED OR UNBALANCED LOADS AS PER CATEGORY C2 OF IS: 15959	YES
112.0	METER HAS SUFFICIENT NON-VOLATILE MEMORY FOR RECORDING HISTORY OF BILLING PARAMETERS (CUMULATIVE KWH and CUMULATIVE KVAH AT THE TIME OF RESET	YES

	AND KVAMD) FOR LAST 12 MONTHS.	
113.0	PROVISION FOR LOAD SURVEY DATA FOR LAST 60 DAYS FOR A CAPTURE PERIOD OF 30 MINUTES ON FIFO BASIS.	YES
114.0	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
115.0	(a) TESTS OF CLIMATIC INFLUENCES SUCH AS TESTS OF PROTECTION AGAINST PENETRATION OF DUST AND WATER (IP 6X), DRY HEAT TEST, COLD TEST, DAMP HEAT CYCLIC TEST	YES
116.0	(b) TESTS FOR ELECTROMAGNETIC COMPATIBILITY (EMC)	YES
117.0	(c) TEST OF IMMUNITY TO ELECTROMAGNETIC HF FIELDS	YES
118.0	(d) RADIO INTERFERENCE MEASUREMENT	YES
119.0	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY	YES
120.0	LICENSED COPIES OF BASE COMPUTER SOFTWARE ARE SUPPLIED FREE OF COST	YES
121.0	METER IS CAPABLE TO COMMUNICATE DIRECTLY WITH LAPTOP COMPUTER.	YES
122.0	BASE COMPUTER SOFTWARE IS SUITABLE FOR ALL TYPES OF DOT MATRIX & INKJET PRINTERS	YES
123.0	SOFTWARE PROVIDED ON LAPTOP / PC IS COMPATIBLE TO READ DATA FROM USB DRIVE	YES
124.0	CABLE WITH USB TERMINATION PROVIDED	YES
125.0	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 60 DAYS	LESS THAN OR EQUAL TO 8 MINUTES

126.0	DOWNLOADING TIME OF ONLY BILLING DATA	LESS THAN OR EQUAL TO 20 SECS
127.0	METERING PROTOCOL AS PER CATEGORY C2 OF IS: 15959 / 2011	YES
128.0	METER PROTOCOL REPORT NO. & DATE	TO BE FILLED BY THE MANUFACTURER
129.0	NAMEPLATE IS CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE	YES
130.0	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER	YES
131.0	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
132.0	MOUNTING ARRANGEMENT AS PER SPECIFICATION PROVIDED	YES
133.0	WHETHER METER IS TYPE TESTED	YES
134.0	TYPE TEST REPORT ENCLOSED WITH THE BID DOCUMENTS	YES
135.0	TYPE TEST REPORT NO. & DATE	TO BE FILLED BY THE MANUFACTURER
136.0	ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS: 13779 / 1999 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY	YES
137.0	METER, MODEM AND ETC. GUARANTEED AS	YES

	PER TENDER DOCUMENT	
138.0	GUARANTEE TO REPLACE METER FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES
139.0	SAMPLE METERS TO BE SUBMITTED AS PER TENDER DOCUMENT	YES
140.0	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	YES
141.0	MANUFACTURING ACTIVITIES AS PER SPECIFICATION	YES
142.0	AGEING TEST CARRIED OUT	YES
143.0	QUALITY ASSURANCE PLAN AS PER SPECIFICATION SUBMITTED ALONG WITH OFFER	YES
144.0	COMPONENT SPECIFICATION IS AS PER SPECIFICATION	YES
145.0	TWO SETS OF DRAWING CLEARLY INDICATING THE GENERAL ARRANGEMENTS, FITTING DETAILS, ELECTRICAL CONNECTIONS ETC. ARE SUBMITTED ALONG WITH THE OFFER.	YES
146.0	TECHNICAL LEAFLETS (USER'S MANUAL) GIVING OPERATING INSTRUCTIONS ARE SUBMITTED ALONG WITH THE OFFER	YES
147.0	THREE COPIES OF DIMENSIONAL DRAWINGS OF THE QUOTED ITEM ARE SUBMITTED ALONG WITH THE OFFER	YES
148.0	DETAILS OF MEMORY USED IN THE METER.	TO BE FILLED BY THE MANUFACTURER

149.0	FOLLOWING IN HOUSE TESTING FACILITIES ARE AVAILABLE A. INSULATION RESISTANCE MEASUREMENT	YES
150.0	B. NO LOAD CONDITION	YES
151.0	C. STARTING CURRENT TEST	YES
152.0	D. ACCURACY TEST REQUIREMENT	YES
153.0	E. POWER CONSUMPTION	YES
154.0	F. FULLY COMPUTERISED METER TEST BENCH SYSTEM FOR CARRYING OUT ROUTINE AND ACCEPTANCE TEST IS AVAILABLE	YES
155.0	G. MANUFACTURER HAS DULY CALIBRATED STANDARD METER OF 0.1 CLASS ACCURACY	YES
156.0	H. GLOW WIRE TESTING	YES
157.0	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	TO BE FILLED BY THE MANUFACTURER
158.0	FURNISH PHYSICAL WATER ABSORPTION VALUE	TO BE FILLED BY THE MANUFACTURER
159.0	FURNISH THERMAL HDDT VALUE	TO BE FILLED BY THE MANUFACTURER
160.0	FURNISH FLAMMABILITY VALUE	TO BE FILLED BY THE MANUFACTURER
161.0	FLAMMABILITY V2	TO BE FILLED BY THE MANUFACTURER
162.0	GLOW WIRE TEST AT 650° C	TO BE FILLED BY THE

		MANUFACTURER
163.0	TENSILE STRENGTH	TO BE FILLED BY THE MANUFACTURER
164.0	FLEXURE STRENGTH	TO BE FILLED BY THE MANUFACTURER
165.0	MODULUS OF ELASTICITY	TO BE FILLED BY THE MANUFACTURER
166.0	IZOD IMPACT STRENGTH NOTCHED 23° C	TO BE FILLED BY THE MANUFACTURER
167.0	GPRS CONNECTIVITY FROM METER TO MSEDCL EXISTING MDAS SYSTEM ENSURED.	YES
168.0	SNMP SUPPORT FOR MODEM	YES

TECHNICAL SPECIFICATIONS OF THREE PHASE SMC METER BOX FOR THREE PHASE EMBEDDED METER

1.0 SCOPE:

This specification covers design, manufacturing, testing at works and supply of Three Phase Meter Box. The Meter Box shall be made out of Sheet Moulding Compound (SMC) confirming to IS: 13410 / 1992 amended upto date & IS: 14772 / 2000 (amended upto date) for use in electrical distribution system in Maharashtra. The system shall be AC three phase, four wires, 415 V, 50 Hz with effectively grounded neutral. The Meter Box shall be suitable for housing LT AC Three Phase, Four Wire, 40-200 Amp AMR Compatible Static TOD Tri-Vector Energy and suitable cables for connection of DTC Meter to Meter to Distribution Box.

2.0 SERVICE CONDITION:

The Meter Box to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions.

Max. & ambient air temperature	50 degree C
Max. relative humidity	100%
Max. annual rainfall	1450 mm
Max. wind pressure	150 Kg/Sq.m
Max. altitude above mean sea level	1000 mtrs
Seismic level (Horizontal acceleration)	0.3 g
Climatic condition	Moderately hot and humid Tropical climate conducive to rust and fungus growth
Ambient temperature for temperature rise	50 deg.C

3.0 APPLICABLE STANDARDS:

Unless otherwise modified in this specification, the meter box shall generally confirm with the provisions of IS: 14772 / 2000 (Amended upto date) and material of construction i.e. for SMC to IS: 13410 / 1992 & requirement of this specification.

4.0 DESIGN & CONSTRUCTION:

4.1 The Meter Box shall be made from Thermosetting Plastic i.e. glass reinforced polyester sheet moulding compound (SMC) confirming to IS: 13410/ 1992, & requirement of this specification.

4.2 Meter Box shall comprise of a moulded base and moulded door manufactured with SMC. The manufacturing process of Box shall be Hot Press Compression Moulding Process for (SMC).

4.3 The base and cover of meter box shall be individually in one piece except for fixing of accessories like hinges, clamp, handles etc.

4.4 The meter box shall be so constructed as to have roof tapering down for easy flow of rainwater.

4.5 SMC Meter Box shall be moulded using 100% virgin SMC, grade S-3 material. The box shall be weather proof, unbreakable and scratch resistant & shall have good workmanship. For SMC, the wall thickness of the meter box base shall be minimum 3 mm on load bearing side and 2 mm on all other sides, thickness of cover shall be minimum 2 mm.

4.6 The Colour of the SMC Meter box shall be Siemens Grey.

4.7 The SMC meter box shall be made of anti-corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant high grade SMC material having good dielectric and mechanical strength property.

4.8 The surface appearance or part of meter box must be smooth, non porous and homogeneous, free from ripples, defects and marks. No fillers or fibres shall be visible at any place.

4.9 The meter box shall have base raised by about 20 mm in the box for easy wiring for fixing the meter. The meter screws shall not protrude outside.

4.10 The Meter Box shall facilitate wireless data communication with minimal disruption for AMR purpose.

4.11 The boxes shall be suitable for outdoor application.

4.12 Corners of the Meter Box shall be round and not pointed ones.

4.13 The minimum inside dimensions of the meter box shall be as per enclosed drawing suitable for installation of all types of meters purchased from various meter manufacturers.

4.14 Hinges, locking arrangement shall be of stainless steel only for SMC Boxes.

4.15 For SMC, the base and cover must be UV stabilized to ensure that it does not get 'Yellow' over a period of time. It shall not change in colour, shape, size, dimensions when subjected to 200 hrs on UV ageing test as per ASTM: G53 (Cl. No. 9.3), 4 Hours UV at 600

deg C and 4 Hours Condensation at 500 deg C. The base and cover shall be capable of withstanding temperature of boiling water for five minutes continuously without distortion or softening.

4.16 The enclosure shall comply with the requirements of IP – 55 for SMC as per IS: 12063 or the latest version thereof.

4.17 For meter reading, the box shall have window with Toughened Glass of 5 mm thickness fixed with stainless steel frame from inside. Glass shall have scratch proof "MSEDCL" logo on the right side bottom comer of the glass. This glass shall be fixed from inside of the cover of Meter Box, with single piece stainless steel frame (Glass Holder). The glass has to be fitted with a wrap around single piece rubber ring without joint made from good quality neoprene rubber so that it can withstand weather effect. The box shall have windows of size 85 mm x 170 mm (± 5 mm).

4.18 The mounting arrangement of the meter shall be on MS Patti/Clamp suitable for meter.

4.19 For cable entry and exit holes of suitable dia with Plastic Gland shall be provided as shown in drawing.

4.20 Earthing Bolts of size 25 x 6 mm fitted with the box from inside, shall be provided for external earthing with 2 plain washers, one spring washer & two nuts. Earthing bolt shall have no layer of powder coating and shall be property zinc plated.

4.21 The body of the meter box shall be moulded in a single piece forming sheet moulding compound without fabrication joints. Minimum clearance 50 mm shall be maintained from left,right and bottom side of the meter, 100 mm shall be maintained fromtop side of meter. Besides, there should be minimum clearance of 20 mm in the front from the face of meter

4.22 Rubber gasket shall be provided all around, wherever required for protecting against entry of dust and water

a. The contents of the box:-

Internal hinges: Internal hinges well protected against corrosion shall be provided on left side of the box. The hinges of the door shall be concealed and they shall be fixed to the flanges provided to the base and cover of the box in such a manner that the door opens by a Min. 90 degrees

b. **Handle:** Suitable handle or knob shall be provided for opening the box door(s).

c. **Earthing Bolt:** A 8mm dia Zinc platted bolt with two numbers washers should be provided.

d. **Fixing Arrangement:** The meter unit fixing Nut-bolts shall not protrude outside. The meter composite unit is to be installed in the box and the box shall be supplied in assembled condition.

4.23 The top cover of the meter box should be of Hinge type having at least 2 nos. U clamps to hold the cover with base with provision of sealing arrangement. The cover and base shall have groove all along with the fitting edge, so that after fixing the top cover, no wire or any device can be, temporary or permanently, inserted in the box.

4.24 Meter shall be fitted on the base of SMC box along with required Metallic hardware. The meters shall be supplied duly mounted on the base of meter box.

4.25 Suitable holes (approx.18-25 mm diameter) shall be provided at the two sides of the meter box for inlet and at bottom for outlet of Phase Wise Power cables as thread through type arrangement

4.26 The box should have proper mounting arrangement so that it could be mounted on the wall or the pole, as the case may be.

4.27 The tolerance permissible on the various dimensions of the Box shall be (±) 5%. However, the tolerance for the fittings shall be (+/-) 3%

4.28 The minimum internal dimensions of the meter box shall be 650 mm height (H) x 500 mm width (W) x 250 mm depth (D) as per enclosed drawing.

4.29 Distribution transformer rating wise cable size

Sr. no.	**Distribution Transformer**		**Cable size**	
	Rating (kVA)	Current carrying capacity (Amps)	Rating (Sq. mm)	Current carrying capacity (Amps)
1	63	84.00	Single Core, LT XLPE cable unarmored, 35 sqmm.	119 A

2	100	133.34	Single Core, LT XLPE cable unarmored, 50 sqmm	145 A- for 50 sqmm cable
Note: Four cables (for each phase & neutral) of length 7 m of suitable size as mentioned above with lugs for connection from Distribution Transformer outgoing to meter to incoming of Distribution Box shall be provided.				

4.30 Roof of meter box shall be tapering down for easy flow of rainwater.

4.31 Heat shrinkable collars shall be fixed to avoid any rainy water in the meter box

5.0 TESTS & TEST CERTIFICATES:

The meter box shall be fully type tested in accordance with the relevant standards and as per MSEDCL requirement. All the Type Tests specified in the technical specifications shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CIPET, EQDC, ERDA, ERTL, CPRI, etc. to prove that equipments meet the requirement of the specification.

The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per respective IS.

The tenderer shall also furnish certificate from laboratories where type tested that required test facility available in-house for that particular test. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The Box shall be fully type tested as per IS: 14772/2000 (amended up to date) and IS: 13410 / 1992 (amended up to date) and as per requirement of this specification. The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per respective IS and other type tests as well as acceptance tests as per table below.

All the Type Tests shall be carried out from Laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, Bangalore /Bhopal, ERDA Baroda, ERTL, EQDC, CIPET to prove that the box meets the requirements of specification. Type Test Reports

conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The type test report of meter box having identical constructional and other features carried out during last three years prior to due date of opening of offer shall be valid.

The detailed type test reports shall be furnished with relevant oscillogram and certified drawings of the equipment tests. The offers without type test reports shall be rejected.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. All the type test reports shall be got approved from the Chief Engineer (Testing & QC), MSEDCL, 5th Floor, Prakashgad, Bandra (E), Mumbai – 400 051 before commencement of supply.

Type Tests for SMC Meter Box

Sr. No.	Test	Reference Standard	Required Value
1	Marking	IS 14772:2000, Cl. 7	Manufacturer Name & Danger Logo Screen Printing
2	Dimensions	IS 14772:2000, Cl. 8	As per specification and drawing
3	Protection against Electric Shock	IS 14772:2000, Cl. 9	As per IS
4	Provision for Earthing	IS 14772:2000, Cl. 10	As per IS
5	Construction	IS 14772:2000, Cl. 11	No Crack or Damage
6	Resistance to Ageing, to humid condition, to ingress of solid objects and to harmful ingress of water	IS 14772:2000, Cl. 12	No Crack or Damage
7	Mechanical Strength	IS 14772:2000, Cl. 13	No Crack or Damage
8	Resistance to Heat	IS 14772:2000, Cl. 14	No ball impression
9	Resistance to Insulating Material to Abnormal Heat and Fire	IS 14772:2000, Cl. 15	No Flame and Glowing
10	Resistance to Rusting	IS 14772:2000, Clause No. 16	No sign of rust observed

11	Resistance to Tracking	IS 14772:2000, Clause No. 17	No failure or breakdown occurs before 50 Drops 175V
12	HeatDeflection Temperature @ 1.8 Mpa (On Enclosure)	IS 13411:1992	> 150
13	Exposure to Flame	IS 4249:1967	Self Extinguishing
14	Flammability	UL-94/IS-11731	V0
15	Melting Point	IS:13360 (Part-6/Sec-10):1992	Does not melt upto 400^0 C
16	Degree of Protection (IP-55)	IS:13947:1993 (Part-1)	IP-55
17	Glow wire test done at 960 deg C	IS:11000	No flame and glowing observed
18	Ball Pressure Test	IEC-335	No Ball Impression Observed
19	UV Ageing Test for 200 Hours	ASTM-G-53	No Colour Change, no chalking and No discoloration observed
20	Water Absorption	IS:13411-1992	< 0.25%
21	Material Identification	As per Laboratory Method	Glass reinforced polyester Sheet Moulding compound (SMC)
22	Glass content, percent by mass (Min.)	IS:13410-1992	20
23	Water Absorption, % Max	IS:13410-1992	0.20
24	Izod impact strength (Notched), KJ/m2	IS:13410-1992	55
25	Flexural Strength ,MPa , Min	IS:13410-1992	170
26	Power Arc Resistance Sec. Min.	IS:13410-1992	180
27	Modulus of Elasticity, 103 , MPa	IS:13410-1992	12 to 15
28	Tracking Resistance CTI, Min	IS:13410-1992	1000
29	Dielectric Strength at 90oC in Oil KV/mm	IS:13410-1992	11

30	Dissipation factor (4 days at 80 % RH & 1 KHz)	IS:13410-1992	0.01
31	Heat Distortion Temperature, oC ,Min	IS:13410-1992	150
32	Oxygen Index,% Min	IS:13410-1992	24

For Acceptance Test, 5 Samples for each lot offered for inspection shall be selected randomly.

6.0 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of Meter box in schedule 'A' attached (As per Guaranteed Technical Particulars uploaded on e - Tendering site). The offers without the details in Schedule 'A' stand rejected.

7.0 TESTING & MANUFACTURING FACILITIES:

The Tenderer must clearly indicate the details of testing facilities available in the works of manufacturer and whether the facilities are adequate to carry out all the Routine and Acceptance tests. These facilities shall be available to MSEDCL Engineers, if deputed to carry out or witness the tests in the manufacturer's works. The tenderer must have all in-house testing facility to carry out acceptance & routine tests on the meter box as per relevant IS. If any test cannot be carried out in the manufacturer works, the same shall be clearly stated. All testing equipments shall be duly calibrated in the NABL approved laboratories. The Bidder shall have the testing facility of flammability test of V0 for SMC Meter Box.

8.0 MANUFACTURING FACILITIES:

SMC Meter Box is offered, the tenderer shall have the following minimum manufacturing facilities in house to prove his reliability as a manufacturer of Energy Metering Box.

(a) SMC material manufacturing machine
(b) Hydraulic press for hot press compression moulding
(c) Assembly lines for fabrication and fitting

9.0 GUARANTEE:

The meter box shall be guaranteed for a period of five years from the date of commissioning or five and half years from the date of dispatch whichever is earlier.

10.0 MARKINGS:

The meter box shall have an indelibly and distinctly marked with all essential particulars as per relevant standards. In addition to the requirement as per relevant standard, following information shall clearly & indelibly be embossed on the cover of the meter box.

a) Purchase order number and date
b) Year and month of manufacture
c) Name of Purchaser: MSEDCL
d) Guarantee: 5 years
e) Name and trademark of manufacturer
f) Danger logo (Screen Printed)

11.0 INSPECTION:

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases. The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. Inspection of the first lot shall be carried out jointly by representative of the Chief Engineer (MM Cell) and Executive Engineer Testing Division.

The MSEDCL representative / Engineer attending the above testing shall carry out testing as per IS: 13947, IS: 13410 / 1992 (amended upto date) & IS: 14772 / 2000 (amended upto date) & this specification and issue a test certificate approval to the manufacturer and give clearance for dispatch.

The manufacturer shall give minimum 14 days notice for inspection of material.

12.0 PACKING:

The meter box shall be suitably packed in corrugated boxes in order to avoid damage during transit or handling.

13.0 REJECTION:

After dispatch of material against inspected lot to various store centers, the Chief Engineer, MM Cell may select one complete meter box at random from the lot of each type that may be supplied to various store centers and shall test the same for all the acceptance and routine tests at any third party NABL Lab.

The 5 days advance intimation shall be given to the supplier and if the supplier fails to attend the same on the date informed, the testing will be carried out in absence of supplier's representative. The results of the testing lab shall not be disputed by the supplier. If the meter box fails in above random sample testing, the lot will be rejected.

14.0 PROTOTYPE SAMPLE:

The successful bidders should manufacture 1 No. of prototype SMC Meter Boxes as per the specification and keep ready at their works for the purpose of sample inspection and testing. The MSEDCL at their option may sent a team of Engineers to the works. Prior intimation of this inspection may not be given to the Bidder.

15.0 SCHEDULES:

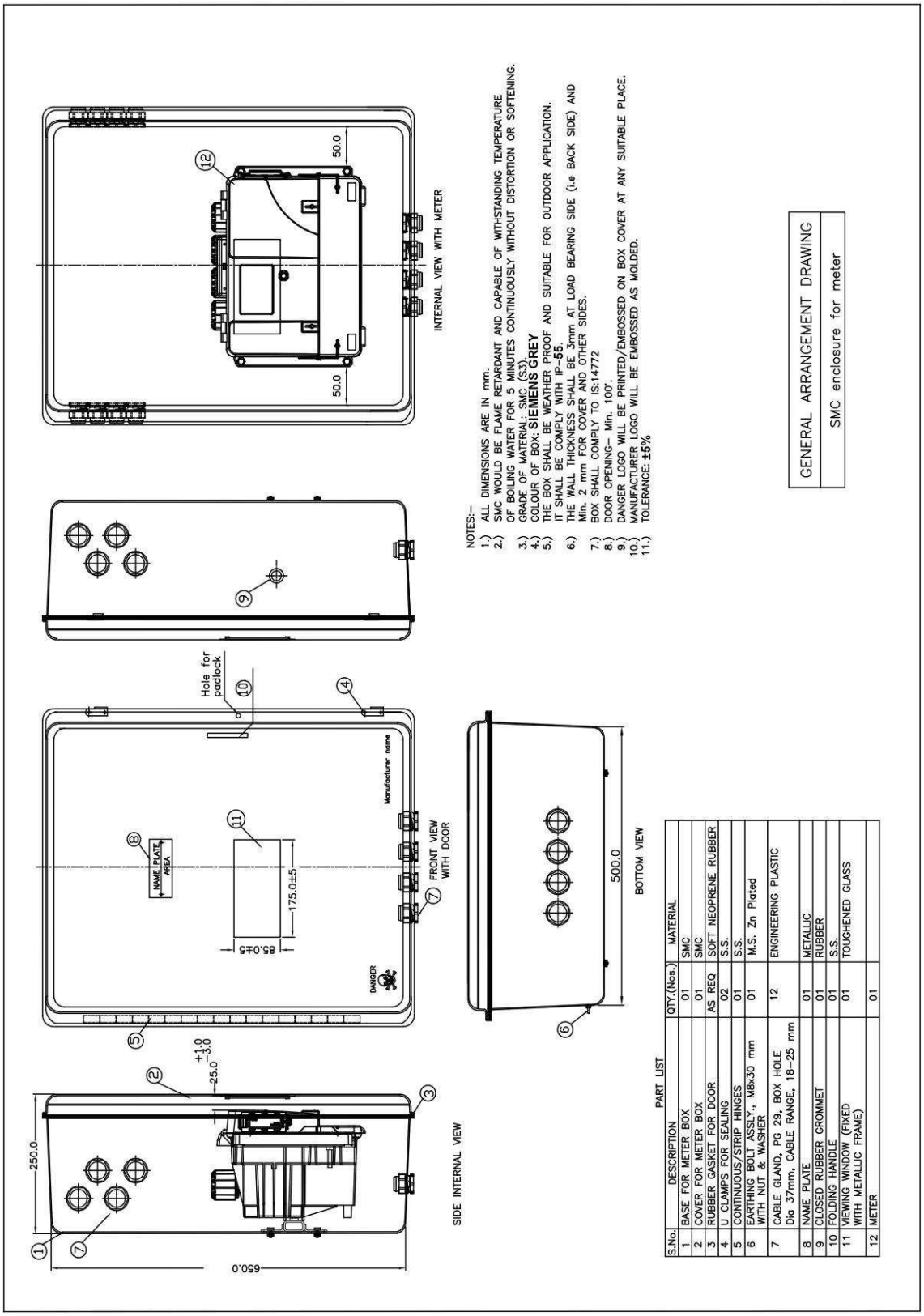
The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule 'A' – Guaranteed Technical Particulars

The discrepancies, if any, between the specification and the catalogues and/or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard will not be entertained.

16.0 DRAWINGS:

The successful bidder shall submit set of all above drawings of the distribution box and its components shall be submitted in triplicate to CE (Testing & QC) office and get approved before commencement of supply.



PART LIST

S.No.	DESCRIPTION	QTY.(Nos.)	MATERIAL
1	BASE FOR METER BOX	01	SMC
2	COVER FOR METER BOX	01	SMC
3	RUBBER GASKET FOR DOOR	AS REQ	SOFT NEOPRENE RUBBER
4	U CLAMPS FOR SEALING	02	S.S.
5	CONTINUOUS/STRIP HINGES	01	S.S.
6	EARTHING BOLT ASSLY., M8x30 mm WITH NUT & WASHER	01	M.S. Zn Plated
7	CABLE GLAND, PG 29, BOX HOLE Dia 37mm, CABLE RANGE, 18-25 mm	12	ENGINEERING PLASTIC
8	NAME PLATE	01	METALLIC
9	CLOSED RUBBER GROMMET	01	RUBBER
10	FOLDING HANDLE	01	S.S.
11	VIEWING WINDOW (FIXED WITH METALLIC FRAME)	01	TOUGHENED GLASS
12	METER	01	

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

LT 300/5 AMPS OR 400/5 AMPS OR 600/5 AMPS OR 800/5 AMPS CT OPERATED SMART ENERGY METER ALONG WITH IN BUILT COMMUNICATION MODULE AS PER IS 16444 PART 2 / 2017

INDEX

Sr. NO.	DESCRIPTION
1.	TECHNICAL SPECIFICATIONS OF LT AC THREE PHASE FOUR WIRE CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI-VECTOR ENERGY METER AS PER CATEGORY "C1" OF IS 15959/2011 (AMENDED UPTO DATE)
2.	TECHNICAL SPECIFICATIONS OF CURRENT TRANSFORMERS
3.	TESTING AND MANUFACTURING FACILITIES
4.	TESTS & TEST CERTIFICATES
5.	GUARANTEED TECHNICAL PARTICULARS
6.	PROTOTYPE & DRAWINGS
7.	GUARANTEE
8.	JOINT INSPECTION AFTER RECEIPT AT STORES
9.	ANNEXURE I
10.	ANNEXURE II
11.	SCHEDULE "A"

TECHNICAL SPECIFICATIONS OF LT AC THREE PHASE FOUR WIRE CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI- VECTOR ENERGY METER AS PER IS 16444 PART 2/2017 CATEGORY "D3" OF IS 15959/2011 (AMENDED UPTO DATE)

1.00 SCOPE:

This specification covers design, manufacturing, testing, supply and delivery of ISI marked LT AC, three Phase, four Wire, 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps CT operated fully Static and AMR compatible TOD Tri - Vector Energy Meters with Optical & in built communication modem as per IS 16444 part 2 / 2017 as per Category D3 of IS: 15959 / for measurement of different electrical parameters listed elsewhere in the document including Active Energy (kWh), Reactive Energy (kVArh) Lag and (kVArh) Lead separately, Apparent Energy (kVAh) etc. in three phase, four wire balanced / unbalanced loads of LT Consumers.

1.01 GENERAL TECHNICAL REQUIREMENT:

1	TYPE	LT AC, Three Phase, Four Wire, 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps CT operated fully Static & AMR compatible TOD Tri - Vector energy Meters with Optical & in built communication modem as per IS 16444 part 2 / 2017 as per Category D3 of IS: 15959 / 2011 for use on LT Consumers installation..
2	FREQUENCY	50 Hz ± 5%
3	ACCURACY CLASS	0.5S (FOR ACTIVE AND REACTIVE ENERGY)
4	RATED VOLTAGE	415 V Ph-Ph or 240 V Ph-N
5	VOLTAGE RANGE.	+10% to -20% of rated voltage.
6	CURRENT RATING	300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps
7	BASIC CURRENT Ib	5 Amps
8	MAXIMUM CONTINUOUS CURRENT (Imax)	2 times (200 %) Ib
9	SHORT TIME OVER CURRENT	As per IS: 16444:Part 2 :2017
10	STARTING CURRENT	0.1% of Ib

11	POWER CONSUMPTION	The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 5.0 W and 15 VA during the idle mode of communication module. The additional power requirement during data transmission shall not exceed 7 W per communication module. The apparent power taken by each current circuit, at basic current Ib, reference frequency and reference temperature shall not exceed 1 VA.
12	POWER FACTOR	Power Factor range: Zero Lag to unity to Zero Lead Avg. P.F = Total(kWh) / Total (kVAh) $kVAh=\sqrt{(kWh)^2+(RkVAhlag+RkVAhlead)^2}$
13	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.1 class) software based test bench.
14	POWER SUPPLY	Switched-Mode Power Supply (SMPS)
15	TEMPERATURE.	The standard reference temperature for performance shall be 27^0 C. The mean temperature co - efficient shall not exceed 0.03%.
16	ISI MARK	The meters shall bear ISI Mark.

1.02 MANUFACTURING FACILITIES

1.02.01 Manufacturer shall possess fully automatic computerized Meter Test Bench System having inbuilt source and load adjustment for carrying out routine and acceptance Tests as per IS: 16444 (Part -2):2017 (amended up to date). In addition this facility shall be able to produce Test Reports for each and every Meter. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly The tenderer shall have the necessary minimum testing facilities for carrying out the following tests.

Sr. No.	Name of Test
(1)	A.C. Voltage test
(2)	Insulation Resistance Test
(3)	Test of Accuracy Requirement
(4)	Test on limits of errors
(5)	Test on meter constant
(6)	Test of starting condition
(7)	Test of no-load condition
(8)	Repeatability of error test
(9)	Test of power Consumption
(10)	Vibration test
(11)	Shock Test
(13)	Tamper conditions - as per MSEDCL, specification
(14)	Glow Wire Test
(15)	Long duration test
(16)	Flammability Test
(17)	The manufacturer shall have duly calibrated RSS meter of class 0.05 accuracy

1.02.02 METER SOFTWARE:

The bidder shall have to get appraised & obtain Capability Maturity Model Integration (CMMI)– Level III within one year from date of letter of award.

1.03 STANDARDS TO WHICH METERS SHALL COMPLY:

IS: 15959 Part 3 - Data Exchange for Electricity Meter Reading, Tariff and Load Control – companion specification for Category – "C1" Meters (amended upto date);

IS: 16444 part 2 / 2017 (amended up to date) for AC Static Transformer operated Watt-hour and VAR-hour Meters, Class 0.5 S – Specification.

CBIP Tech-Report - 325 amended up to date for AC Static Transformer operated Watt Hour & VAR-Hour Meters (class 0.5S);

IS: 15707 / 2006 Specification for Testing, evaluation, installation &

maintenance of AC Electricity Meters-Code of Practice;

CEA regulations and MERC guidelines with latest amendments.

The specification given in this document supersedes the relevant clauses of IS: 14697 / 1999 (amended up to date) wherever applicable.

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standard mentioned above, also shall be considered.

In case the bidder wishes to offer material conforming to the other authoritative standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Copy of such standards with authentic English Translations, shall be furnished along with the offer.

In case of conflict related with communication protocol, the Indian standard IS: 15959 / 2011 Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification shall prevail upon.

For conflict related with other parts of the specification, the order of priority shall be – (i) this technical specification, (ii) 16444 part 2 / 2017 amended upto date & CBIP Tech-Report - 325. (iii) Relevant IEC.

In case of any difference between provisions of these standards, the provisions of this specification shall prevail.

1.04 CONSTRUCTIONAL REQUIREMENT

1.04.02 GENERAL MECHANICAL REQUIREMENT

The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially.

1.04.02.1 personal safety against electric shock:

1.04.02.2 personal safety against effects of excessive temperature;

1.04.02.3 safety against spread of fire;

1.04.02.4 Protection against penetration of solid objects, dust and water.

1.04.02.5 Detection of fraud / pilferage

1.04.03 The meter shall be projection type and shall be dust and moisture proof. All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

1.04.04 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non-ageing and of tested quality.

1.04.05 METER CASE

1.04.05.01 The meter base & cover shall be made out of unbreakable, high grade, fire resistant polycarbonate material so as to give it tough and non-breakable qualities. Meter base shall be opaque and meter top cover shall be transparent/ opaque.

1.04.05.02 The polycarbonate body of the meter shall conform to IS: 11731 / 1986 (FV-2 Category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 2008 or IEC-60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2) 1986. The type test certificate shall be submitted along with the offer.

1.04.05.03 The polycarbonate base and cover of meter shall be ultra-sonically welded (continuous welding) or chemically welded so that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).

1.04.05.04 The meter body shall be type tested for IP51 degree of protection as per IS: 12063 against ingress of dust, moisture & vermin. The type test certificate shall be submitted along with the offer.

1.04.05.05 The meter cover shall be secured to base by means of sealable unidirectional captive screws with two holes.

1.04.06 TERMINALS & TERMINAL BLOCK

1.04.06.01 The terminal block shall be made from high quality non-hygroscopic, fire retardant, reinforced polycarbonate / non-Bakelite material which shall form an extension of the meter case.

1.04.06.02 The material of which the terminal block is made shall be capable of passing the tests given in IS: 1336O (Part 6/Sec 17), ISO 75-1 (1993) & ISO 75-2 (1993) for a temperature of 1350C and a pressure of 1.8 MPa (Method A). The type test certificate shall be submitted along with the offer

1.04.06.03 The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

1.04.06.04 The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

1.04.06.05 Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times

during the life of meter shall screw into metal nuts.

1.04.06.06 All parts of every terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

1.04.06.07 Electrical connections shall be so designed that contact pressure is not transmitted through insulating material of the terminal block.

1.04.06.08 The terminals, the conductor fixing screws or the external or internal conductors shall not be liable to come into contact with terminal covers.

1.04.06.09 Two screws shall be provided in each current & potential terminal for effectively clamping the external leads or thimbles.

1.04.06.10 Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall be such as not to pierce and cut the conductors used.

1.04.06.11 The minimum internal diameter of terminal hole shall be as per 16444 part 2 / 2017.

1.04.06.12 The manufacturer shall ensure that the supporting webs between two terminals of the terminal block shall be sufficiently high to ensure that two neighboring terminals do not get bridged by dust and there shall not be any possibility of flash over between adjacent terminals of the terminal block

1.04.06.13 TERMINAL COVER

1.04.06.14 The termination arrangement shall be provided with an extended transparent terminal cover as per IS 16444 part 2 / 2017 (amended up to date) irrespective of rear connections.

1.04.06.15 The terminal cover shall be made out of same material as that of meter body. The terminal cover shall be unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The terminal cover shall be transparent.

1.04.06.16 The terminal cover shall be provided with one side hinge

1.04.06.17 The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

1.04.06.18 Independent sealing provision shall be made against opening of the terminal cover and front cover to prevent unauthorized tampering. It is necessary to provide Bidirectional screws with two holes for sealing purpose of terminal cover. The meter shall be pilfer-proof & tamper-proof.

1.04.06.19 The fixing screws used on the terminal cover for fixing and sealing in terminal cover shall be held captive in the terminal cover.

1.04.06.20 Proper size of grooves/U Cut shall be provided at bottom of this terminal cover for incoming service connections.

1.04.06.21 When the meter is mounted, no access to the terminals by any means shall be possible without breaking seals(s) of the terminal cover.

1.04.07 RESISTANCE TO HEAT AND FIRE

The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them

1.04.08 The meter shall be completely factory sealed except the terminal block cover

1.04.09 The provision shall be made on the meter for at least two seals to be put by utility user

1.04.10 A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than 10 in red colour, which reads as

1.04.11 “सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने वीज नोंदणी होणार.

1.04.12 A Push button facility shall be provided for high resolution reading / alternate mode of display, as brought out elsewhere in this specification. Facility of scrolling of all the reading up and down in all display mode shall be provided.

2.0 OUTPUT

The meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from front. The test output device shall be provided in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. The pulse rate of output device which is Pulse / kWh and Pulse / kVArh (meter constant) shall be indelibly provided on the nameplate.

2.01 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

2.02 The meter shall also be capable to withstand and shall not get damaged if phase to phase voltage is applied between phases & neutral for five minutes.

2.03 In meter, power supply unit shall be micro control type instead of providing conventional transformer and then conversion to avoid magnetic influence. Power supply shall immune to magnet influence.

2.04 Non specified display parameter in the meter shall be blocked and it shall not be accessible for reprogramming at site.

2.05 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc.

2.06 CTs are to be provided with magnetic shielding and they shall be tested separately prior to assembly.

2.07 PCB used in meter shall be made by Surface Mounting Technology.

3.0 REAL TIME INTERNAL CLOCK (RTC):

The real time clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 Seconds per year. Facility for adjustment of real time shall be provided through CMRI with proper security.

The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following:

a) Hand Held Terminal (HHT) or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger “PC”.

The RTC battery & the battery for display in case of power failure shall be separate.

Event log for changes in RTC shall be available with Date & Time.

3.01 The meter shall withstand any type of High Voltage and High Frequency

surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter. The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 KV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(i) On any of the phases or neutral terminals

(ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(iii) At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device.

3.01.01 SELF DIAGNOSTIC FEATURES:

(i) The meter shall keep log in its memory for unsatisfactory functioning or nonfunctioning of Real Time Clock battery or low battery indication on display, also it shall be recorded and indicated in reading file at base computer software computer or to remote reading system.

(ii) All display segments: "LCD Test" display shall be provided for this purpose.

3.01.02 METER PROTOCOL:

The meter protocol shall be as per Annex E - Category D3 meters of IS 15959 part 3: 2017 amended upto date.

3.01.03 The watch dog provided shall invariably protect the hanging of microprocessor during such type of tampering devices

3.01.04 COMMUNICATION CAPABILITY:

The meter shall be provided with following provisions for communication of the measured / collected data as per IS 16444 Part 2: 2017 ie a communication module (4G/2G/3G/NB- IoT/PLCC/LPRF) and an Optical port complying with hardware specifications detailed in IEC 1107. This shall be used for local data downloading through a DLMS compliant HHU, Mobile Application.

Sealing arrangement for Optical & communication module as required shall be provided.

During data communication process through either AMR or MRI, the meter energy recording should not get affected.

Optical port shall support the default and minimum baud rate of 9600 bps.

Communication Module: - The smart Meter shall have bidirectional communication module which shall integrate with meter. The communication module shall accommodate 4G/2G/3G/NB-IoT for bidirectional comms with HES. Meter shall be capable to record the communication module removal as an event.

3.01.05 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal battery may be provided.

3.01.06 The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided. Non Rechargeable (Primary Battery) shall also be accepted battery alternatively, push button provided for displaying alternate mode (On Demand Mode) parameters shall also be acceptable for activation of battery during power OFF condition.

3.01.07 Wire / Cable less design: The meter PCB shall be wirel ess to avoid improper and loose connections/ contacts.

3.01.08 The Meter shall record and display total energy including Harmonic energy.

3.01.09 The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

3.01.10 Reverse reading lock of main kWh and kVAh reading is to be incorporated with necessary software modification if required additionally.

4.0 DEMAND INTEGRETION PERIOD:

The maximum demand integration period shall be set be 30 minutes by block window method.

4.1 MD RESET:

The meter shall have following MD resetting options.

4.1.01 Communication driven reset;

4.1.02 Manual resetting arrangement with sealing facility;

4.1.03 Automatic reset on First day of every month at 00.00 Hrs - This option shall be blocked by default and made programmable through hand held terminal / CMRI for the actual date required.

4.2 TOD TIMING:

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable. At present the time zones shall be programmed as below.

Zone “A”: - 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs

Zone “B”: - 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs

Zone “C”: - 09=00 Hrs. to 12=00 Hrs.

Zone “D”: - 18=00 Hrs. to 22=00 Hrs.

4.3 TAMPER AND FRAUD MONITORING FEATURES

5.0 ANTI TAMPER FEATURES

The meter shall detect and correctly register energy only in forward direction under following tamper conditions:

5.1.01.01 Change of phase sequence: The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

5.1.01.02 Reversal of line and load terminals: Even on interchanging the load and line wires, the meter shall register correct energy passing through the meter. The meter shall also display the energy recorded in reverse mode separately.

5.1.01.03 Drawing of current through local Earth: the meter shall register accurate energy even if load is drawn partially or fully through a local earth or record energy as prevailed electrical conditions.

5.1.01.04 The three phase meter shall continue to work even without neutral at any load condition.

5.1.01.05 The three phase meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.

5.1.01.06 The meter shall work without earth.

5.1.01.07 The potential link shall not be provided.

5.1.01.08 Visual indication shall be provided to safeguard against wrong connections to the meter terminals.

5.1.01.09 The meter shall be immune to the external magnetic field (AC / DC / Permanent) as per CBIP325. If the accuracy of the meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record Energy considering the maximum value current (Imax) at ref. voltage and unity PF in all the three phases.

5.1.01.10 If a consumer tries to steal power by disconnecting the voltage supply of one or two phases of the meter externally or by tampering so that no voltage is available to voltage circuit of meter & normal current is flowing in these phases, the meter shall record the energy (kWh and kVAh) at Vref, current

available in these phases & average power factor of remaining healthy phases. This event shall be logged (occurrence and restoration) along with instantaneous readings of energies with date and time.

5.1.01.11 If, somehow the voltage circuit of one / two / all phase(s) of meter gets disconnected on its own due to faults in LT distribution network, the meter shall record the energy of that phase at Vref, current available in that phase & UPF.

5.1.01.12 The meter shall remain immune for the test of electromagnetic HF/RF defined. For any higher signals than the present standards and MSEDCL technical specifications indicated above, the energy meters shall be immune & accuracy of the energy meters shall not get affected.

5.1.02 TAMPER EVENTS.

5.1.02.1 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS

5.1.02.2 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh power factor, event code, date & time etc. listed in Table 15959 part 3: 2017

5.1.02.3 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping as per table of IS: 15959 part 3: 2017 and the meter shall continuously display that the cover has been tampered

5.1.02.4 In the event the meter is tampered by remote control device (Jammer) same shall be recorded on Tamper event with date & time stamping.

5.1.02.5 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter

5.1.02.6 Tamper details shall be retrieved by authorized personnel through either of the following:

5.1.02.7 HHT.

5.1.02.8 Remote access through suitable communication network

5.1.02.9 Minimum 300 numbers of events (occurrences & restoration

with date & time) shall be available in the meter memory.

5.1.02.10 The recording of abnormal events shall be on FIFO basis. The unrestored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months).

5.1.02.11 All the information of data shall be made available in simple & easy to understand format

5.1.02.12 The threshold values for various tamper are as below.

Sr. No.	**Description**	**Occurrence (With Occ. Time 5 min.)**	**Restoration (With Rest. Time 5 min.)**
1.	PT link Missing (Missing potential)	< 50% of Vref and current in that phase is > 1% of Ib	> 5o% of Vref
2.	Over voltage in any phase	> 115 % of Vref	<115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance	> 10 % Vref	< 10 % Vref
5.	CT reverse	--	--
6.	CT Open	Zero Amps in one or two phase and current in at least 1 phase is > 5% of Ib for 15 minutes	> 5 % I_b in the tampered phase for 15 min
7.	Current Unbalance	> 30 % *I_{ref} for 15 min	< 30 % *I_{ref} for 15 min
8.	Current Bypass	> 50 % Iref for 15 min	< 30 % I_{ref} for 15 min
9.	Over Current in any Phase	> 120 % I_b	< 120 % I_b
10.	Influence of permanent magnet or AC/ DC electromagnet / permanent magnet	Immediate	1 minute after removal
11.	Neutral Disturbance	--	--

12.	Power failure	Immediate	Immediate
13.	Very Low PF	--	--
14.	Meter Cover Opening	(2 to 4 mm) Immediate (Occurance only)	

*	Higher of 3 phase currents shall be taken as reference for this purpose.

6.0 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for poly phase balanced or unbalanced loads:

6.1.01 Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc. as per details given in the table below and IS 15959 part 3: 2017.

6.1.02 Block Load Profile Parameters such as kVAh / kWh / kVArh (lag) /kVArh(lead) / Maximum Demand (MD) in kW / kVA /power factor /phase and line voltages / currents etc. as per details given in the table below and IS 15959 part 3: 2017.

6.1.03 Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh (lag and lead), etc. as per details given in the table below and IS 15959 part 3: 2017.

In addition to above, the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters respectively of IS15959 part 3: 2017.

6.2 DISPLAY OF MEASURED VALUES

7.0 DISPLAY INDICATORS

The supply indication shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the meter. In case of non available of voltage to any phase(s), the LEDs of that particular phase shall stop glowing on the LCD display of meter

7.1.01 The permanently backlit display shall show relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years. In the case of multiple values presented by a single display, it shall be possible to display the content of all relevant memories. When displaying the memory, the identification of each parameter applied shall be possible. The principal

unit for the measured values shall be the kilowatt-hour kWh for active energy, kVArh for reactive energy and kVAh for apparent energy.

7.1.02 The meter shall have minimum 6 digits (with +/- indication) parameter identifier, permanently backlit Liquid Crystal Display (LCD) with wide viewing angle. The size of digit shall be minimum 10x5 mm. The decimal units shall not be displayed in auto scroll mode. However it shall be displayed in push button mode or alternate mode for high resolution display for testing. Auto display cycling push button is required with persistence time of 9 Seconds. LCD shall be suitable for temperature withstand of 70^0 C; the adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

7.1.03 The meters shall be pre-programmed for following details.

7.1.03.01 Voltage Rating: 415 V Ph-Ph

7.1.03.02 CT Ratio: 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps.

7.1.03.03 MD Integration Period is 30 Minutes real time based.

7.1.03.04 Average power factor with 2 decimal digits shall be displayed.

7.1.03.05 The meter shall Auto reset kVAMD at 24.00 Hrs. of last day of the month as per clause 6.07 (iii) and this value shall be stored in the memory along with the cumulative kWh and kVAh reading.

7.1.03.06 The array of data to be retained inside the meter memory shall be for the last 60 days for a capture period of 30 minutes. Load survey data shall be first in first out basis (FIFO).

7.1.03.07 The display of various electrical parameters in Normal Mode & Alternate mode shall be as per table 27 & 29 (except 8 & 9) of IS:

15959 part 3: 2017. in the sequence given as below. Display other than specified shall be blocked. The scroll period for auto scroll shall be 9 secs.

(A)	**Default Display**
1.	LCD Test
2.	Meter Sr. No.
3.	Real Time Clock – Date & Time
4.	Cumulative Energy – kWh

5.	Cumulative Energy – kWh - TOD Zone A (TZ1)
6.	Cumulative Energy – kWh - TOD Zone B (TZ2)
7.	Cumulative Energy – kWh - TOD Zone C (TZ3)
8.	Cumulative Energy – kWh - TOD Zone D (TZ4)
9.	Cumulative Energy – kVArh - Lag
10.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
11.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
12.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
13.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)
14.	Cumulative Energy –kVArh - Lead
15.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
16.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
17.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
18.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)
19.	Cumulative Energy – kVAh
20.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
21.	Cumulative Energy – kVAh - TOD Zone B (TZ2)
22.	Cumulative Energy – kVAh - TOD Zone C (TZ3)
23.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
24.	Current MD – kVA with occurance date & time
25.	MD - kVA – TOD Zone A (TZ1) with occurance date & time
26.	MD - kVA – TOD Zone B (TZ2) with occurance date & time
27.	MD - kVA – TOD Zone C (TZ3) with occurance date & time
28.	MD - kVA – TOD Zone D (TZ4) with occurance date & time
29.	Number of MD – kVA reset

30.	Rising MD with elapsed time
31.	Three Phase Power Factor – PF
32.	Cumulative Tamper Count
33.	Meter Cover Opening –Occurance with date and time.
(B)	**On – Demand Display (Alternate Display)**
1.	Last date & time of MD - kVA reset
2.	Current – I_R
3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_R
6.	Voltage – V_Y
7.	Voltage – V_B
8.	Signed Power Factor – R Phase
9.	Signed Power Factor – Y Phase
10.	Signed Power Factor – B Phase
11.	Frequency
12.	High resolution kWh (for calibration)
13.	High resolution kVArh Lag(for calibration)
14.	High resolution kVArh Lead(for calibration)
15.	High resolution kVAh (for calibration)
16.	Rising MD with elapsed time (for calibration/testing)
17.	M1 MD - kVA – TOD Zone A (TZ1) with occurance date & time
18.	M1 MD - kVA –TOD Zone B (TZ2) with occurance date & time
19.	M1 MD - kVA – TOD Zone C (TZ3) with occurance date & time
20.	M1 MD - kVA – TOD Zone D (TZ4) with occurance date & time

21.	M2 MD - kVA – TOD Zone A (TZ1) with occurance date & time
22.	M2 MD - kVA –TOD Zone B (TZ2) with occurance date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurance date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurance date & time
25.	Last Tamper Event with date and time.

7.1.03.08 Other kVA MD values shall be available in reset backup data for 12 months.

7.1.03.09 The meter display shall return to Default Display mode (mentioned above) if the 'Push button' is not operated for 15 seconds

7.2 BILLING DATA, BILLING HISTORY & BLOCK LOAD SURVEY:

7.2.1 BILLING DATA:

The billing data shall be as per table 29 of Annex E of IS: 15959 part 3: 2017. and is summarized as below.

SR. NO.	BILLING PARAMETERS
1.	Billing Date
2.	System Power Factor for Billing Period
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh - Lag
9.	Cumulative Energy – kVArh - Lead
10.	Cumulative Energy – kVAh
11.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
12.	Cumulative Energy – kVAh – TOD Zone B (TZ2)

13.	Cumulative Energy – kVAh – TOD Zone C (TZ3)
14.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
15.	MD – kVA with occurance date & time
16.	MD – kVA – TOD Zone A (TZ1) with occurance date & time
17.	MD – kVA – TOD Zone B (TZ2) with occurance date & time
18.	MD – kVA – TOD Zone C (TZ3) with occurance date & time
19.	MD – kVA – TOD Zone D (TZ4) with occurance date & time

7.2.1.1 BILLING HISTORY:

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 12 months. Meter shall record the midnight snapshot of the cumulative energy values and daily MD value. Billing data shall display the history for past 60 days midnight snaps. The days where there is no power on should not be considered

7.2.2 BLOCK LOAD SURVEY:

The Block 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, however if there is no power for few block within one day those block should be displayed with 0 values with marking of power fail indication for that block i.e. for every day when there was power on, **the meter must record 48 blocks**. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. This 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 (Excel sheet).

The Block Load survey data shall be for specified parameters as per table for 3Φ/4W system of measurement with NEUTRAL as reference point of Annex E of IS: 15959 part 3: 2017 The specified parameters are summarized as below.

SR. NO.	BLOCK LOAD SURVEY PARAMETERS
1.	Real time clock, date and time
2.	Current, I_R

3.	Current, I_Y
4.	Current, I_B
5.	Voltage, V_{RN}
6.	Voltage, V_{YN}
7.	Voltage, V_{BN}
8.	Block energy, kWh
9.	Block energy, kVArh (lag)
10.	Block energy, kVArh (lead)
11.	Block energy, kVAh

7.3 DEMONSTRATION:

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

7.4 PERFORMANCE UNDER INFLUENCE QUANTITIES:

7.4.1 The meters performance under influence quantities shall be governed by IS: 16444 part 2 / 2017. (amended upto date)

7.4.2 The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 16444 part 2 / 2017 (amended upto date).

7.5 COMPUTER SOFTWARE :

7.5.1 For efficient and speedy recovery of data downloaded through HHU on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier.

7.5.2 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall be suitable for all types of printers such as dot matrix, inkjet, deskjet and laser printers.

7.5.3 The Base Computer Software shall be "Windows" based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as HHT by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS.

7.5.4 The Base Computer Software should be password protected.

7.5.5 The total time taken for downloading Billing, Tamper and Load Survey Data for 60 days shall be less than or equal to 8 minutes.

7.5.6 Downloading time of only Billing data shall be less than or equal to 20 secs.

7.5.7 The BCS software shall create one single file for the uploaded data, e.g. if CMRI contains the meter readings of, say, 2,000 consumer meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading in ASCII format or XML file as per MIOS for individual meter reading.

7.5.8 Meter manufacturers should also need to submit Convert API (API3) as per MIOS universal standard along with Base Computer System free of cost. This API should capable of converting both data i.e. AMR data collected from Read API (API1) and MRI data collected from CMRI.

7.5.9 Also there shall be a provision to give filenames while creating the file.

7.5.10 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3.

7.5.11 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

7.5.12 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHT.

7.5.13 The software provided on laptop or PC shall be compatible to read the data from USB drive.

7.5.14 MSEDCL is procuring large quantity of meters. As such manufacturer have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing

7.5.15 & Quality Control Cell / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

7.6 CONNECTION DIAGRAM AND TERMINAL MARKING

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the

above diagram. The diagram & terminal marking on sticker shall not be allowed.

7.7 NAME PLATE AND MARKING OF METERS

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. Meter Serial Number shall be Bar Coded along with numeric number. The size of bar code number shall not be less than 35x5 mm. The manufacturer's meter constant shall be marked on the name plate. Meter serial number & bar code on sticker will not be allowed. In addition to the requirement as per IS, following shall be marked on the name plate.

(i) Purchase order No & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Period as per tender document

(v) ISI mark

(vi) Category of Meter: **Category D3 – LT CT Consumer Meter**. The lettering shall be bold in 3 mm font.

(vii) A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than 10 in red colour, which reads as "सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने वीज नोंदणी होणार.

7.8 TESTS:

7.19.01 TYPE TESTS:

The meter offered shall have successfully passed all type tests described in the IS: 16444 part 2 / 2017 (Amended upto date)

The Type Test Reports shall clearly indicate the constructional features of the type tested meter. Separate type Test Reports for each offered type of meter shall be submitted along with offer.

The Type Test Certificate as per IS16444 part 2 / 2017. (Amended up to date) shall be submitted along with the offer. The Type Test certificate carried out during last five years prior to the date of offer shall be valid.

All the type test reports shall be got approved from Chief Engineer, MSEDCL, Testing & Quality Control Cell, Prakashgad, Mumbai.

All the Type Tests specified in the technical specifications and as per IS: 16444 part 2 / 2017.shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as ERDA, ERTL, CPRI,YMPL etc. Type Test

Reports conducted in manufacturers own laboratory though it is NABL and certified by testing institute shall not be acceptable.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix - C of Latest – standardization of AC static electrical energy meters – CBIP publication No. 325 / NPL / CQAL / ERTL / ERDA at the sole discretion of the purchaser at the purchaser's cost. The supplier shall have no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

Additional acceptance test shall be submitted before commencement of supply & get approved from CE (Testing & Quality Control).

7.9 ACCEPTANCE & ROUTINE TESTS:

Criteria for selection for such tests and performance requirements shall be as per IS: 16444 part 2 / 2017(Amended upto date).

ALL acceptance tests as per IS: 16444 part 2 / 2017. shall be carried out on the meter.

All acceptance tests as per IS: 11731 (Part-2)/ 1986 shall be carried out on the meter body, heat deflection test as per ISO:75, glow wire test as per the IS:11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2)/ 1986

All routine tests as per IS: 16444 part 2 / 2017.shall be carried out on all the meters.

7.9.01 ADDITIONAL ACCEPTANCE TESTS:

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 16444 part 2 / 2017. (amended up to date)

7.9.01.01 OTHER ACCEPTANCE TESTS:

7.9.01.01.1 The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage / problems.

7.9.01.01.2 Meters shall be tested for tamper conditions as stated in this specification.

7.9.01.01.3 Glow wire testing for poly-carbonate body.

7.9.01.01.4 Power consumption tests shall be carried out.

7.9.01.01.5 The meter shall comply all the tests for external AC / DC magnetic field as per CBIP325. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor in all the three phases. After removal of magnet, meter shall be subjected to accuracy test as per IS16444 part 2 / 2017. (Amended upto date). No deviation in error is allowed in the class index as per IS16444 part 2 / 2017. (amended upto date) & this specification.

7.9.01.01.6 The meter shall withstand impulse voltage as per relevant IS.

The tests 6.19.03 (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 6.19.03 (v) to (vi) shall be carried out on one sample from first lot as per procedure laid down in IS16444 part 2 / 2017 (Amended up to date). The test report shall be got approved from Chief Engineer, Testing & Quality Control Cell before commencement of supply.

7.9.02 For influence quantities like, voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error shall be as per IS: 16444 part 2 / 2017.(amended up to date).

7.10 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish the particulars giving specific required details of meters in schedule `A' attached. The offers without the details in Schedule “A” stand rejected.

7.11 PRE-DESPATCH INSPECTIONS:

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases. The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL’s representative / Engineer attending the above testing shall carry out testing as per IS: 16444 part 2 / 2017 & this specification and

issue test certificate approval to the manufacturer and give clearance for dispatch.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division.

7.12 QUALITY CONTROL:

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works. Tender samples as per tender document shall be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples.

7.12 MANUFACTURING PROCESS, ASSEMBLY, TESTING:

7.12.1 Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer PCB assembly with PTH (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic pick-and-place machines, Reflow Soldering oven, for stabilized setting of the components on PCB. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub- assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of "PCB" with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent "ESD" failure to be provided. Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block / stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

7.12.2 MANUFACTURING ACTIVITIES:

Quality should be ensured at the following stages:

a) At PCB manufacturing stage each board shall be subjected to computerized bare board testing.

b) At insertion stage all components should undergo computerized testing for conforming to design parameters and orientation.

c) Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipments (ATEs)

d) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters shall be kept in ovens for 72 hours at 55 0C temperature and atmospheric humidity under real life condition at it's full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.

e) The calibration of meters shall be done in-house.

f) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.

g) Bought out items:- A detailed list of bought out items which are used in the manufacture of the meter shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

h) List of Plant and Machinery:

Sr. No.	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meters	Routine Testing and Calibration of Meters
2	Semiautomatic testing Bench with MSVT	Routine Testing and Calibration of Meters
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meters Class 0.01 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meters
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering

12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO -E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meters
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meters
30	Short term over Current testing setup	Type testing of Meters
31	Magnetic and other tamper testing setups	Tamper Testing

32	Impulse Voltage Testing Setup	Type testing of Meters
33	Composite Environmental testing chambers	Type testing of Meters

7.13 COMPONENT SPECIFICATION:

As per Annexure - I enclosed.

8.00 TECHNICAL SPECIFICATIONS OF CURRENT TRANSFORMERS:

8.01 The Current Transformers shall be resin cast, copper wound primary type confirming to IS: 16227 (amended upto date). Four CTs including one for Neutral shall be casted as one unit.

8.02 The CT set shall comprise of 4 Nos of CTs (for three phases and neutral circuits) moulded separately in resin cast epoxy or equivalent insulating materials. In the event of failure of one CT, it shall be individually replaced.

8.03 Technical parameters:

a) Type : Epoxy moulded Ring Type CTs
b) Primary Current : 300 Amps or 400 Amps or 600 Amps or 800 Amps
c) Secondary current : 5A
d) Rated continuous thermal factor : 1.2 times
e) Rated voltage : 415 Volts
f) Frequency : 50 Hz
g) Accuracy Class : 0.5s
h) Limits of Error (Current) : As per IS: 16227
i) Limits of Error (Phase displacement) : As per IS:16227
j) Rated burden : 5 VA
k) Instrument Security Factor : ≤ 5
l) Power frequency withstand voltage for secondary : 3 KV rms for 1 minute
m) Impulse withstand Voltage : As per relevant IS
n) Short time withstand current / duration 25 KA for 1 Seconds
o) Temperature rise (Maximum) 70° C

8.04 The accuracy class of the measuring current transformers shall be 0.5s as per the technical requirements

8.05 The CT shall have multi stranded flexible Cu wires of adequate rating and length for secondary side of the CTs.

8.06 The CT shall be capable of continuous operation of rated output under the operating conditions of voltage and frequency variations as per statutory limits governed by relevant Indian Standard and its amendments in force

8.07 Bar Primary:

8.07.01 The bar shall be fabricated from flat EC grade virgin copper bar. The dimensions of the bar primary shall be marked on the drawing to be submitted by the manufacturer

8.07.02 The manufacturer shall provide good quality GI bolts & nuts of appropriate size for tightening the power cables to the same

8.08 Secondary terminals:

8.08.01 The design and size of the secondary studs shall be such that the terminals are suitable to carry up to 10 Amps continuously.

8.08.02 The manner of fixing the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating

8.09 The complete type tests enumerated in following table as per relevant IS: 16227 (Part 1 & 2) / 1992 amended up to date shall be submitted and got approved from the Office of the Chief Engineer, Testing & Quality Control Cell, MSEDCL, 5th Floor, Prakashgad, Bandra (E), Mumbai – 400 051 as per the tender conditions.

Sr. No.	Name of Test.
1)	Over Voltage Inter-Turn Test
2)	Verification of Terminal Marking & Polarity
3)	Determination of Errors according to the requirements of the appropriate accuracy class
4)	Lightning Impulse Voltage Withstand test
5)	Power Frequency Dry Withstand Test on Primary Winding
6)	Power Frequency Dry Withstand Test on Secondary Winding
7)	Temperature rise test
8)	Instrument Security Factor Test
9)	Short Time Current Test

9.0 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish particulars giving specific required details of the CT Operated Metering Cabinet, CT Operated Meters, CTs & s in schedule “A” attached. The offers without duly the details in Schedule `A' stands rejected.

10.00 PROTOTYPE & DRAWINGS:

The successful tenderer shall have to manufacturer the prototype Cabinet

for each rating as per these specifications before bulk manufacturing. The tenderer shall intimate the readiness of prototype to the Chief Engineer, Material Management Cell. The representative of the Chief Engineer, Material Management Cell shall inspect the prototype on any day within 15 days from the date of readiness intimated. The inspection report of prototype jointly signed by manufacturer and MSEDCL representative along with the drawings shall be submitted by the tenderer to the Chief Engineer, Material Management Cell. The Tenderer shall submit the final drawings in line with these specifications and the prototype to the Chief Engineer, Material Management Cell for approval before bulk manufacturing. The approval of prototype & drawings shall be the responsibility of tenderer. No extra period shall be allowed for getting approval of prototype and drawing & this shall be inclusive in the period of delivery schedule given by the tenderer.

11.00 GUARANTEE:

The equipments supplied shall be guaranteed as per tender document. Bidders shall guarantee to repair or replace free of cost the meters, HHTs, CTs, s and meter boxes (if supplied), which are found defective / inoperative at the time of installation, or become inoperative / defective during guarantee period. Replacements shall be effected within one month from the date of intimation.

12.0 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing):

After dispatch of material against inspected lot to various store centers, the RST of sample CT operated meters shall be carried out at each store where the quantities are supplied against the inspected lot. For this purpose, two nos. of samples out of each 100 Nos. received quantity of the Metering Cabinet shall be selected for testing.

The meters shall be tested by our Executive Engineer (Testing) in presence of Supplier's representative jointly for (i) no load condition; (ii) limits of error test; (iii) starting Condition; (iv) repeatability of error test and (v) tamper conditions as per this specification. The 5 days advance intimation will be given to the supplier and if the suppliers fail to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of supplier's representative. If the meters failed in above random sample testing, the lot will be rejected.

For the purpose of RST of CTs any one of the stores where metering cabinets are dispatched against inspected lot shall be selected by Chief Engineer, Material Management Cell and the acceptance & routine tests shall be carried out on two numbers of CTs & s of individual rating each at the MSEDCL Testing Laboratory for the testing facilities available. The balance tests shall be carried out at the nearby third party recognized testing laboratory. The testing results of CTs & s shall be applicable to the

inspected lot quantity supplied to various stores. The following tests are to be carried out as per relevant IS for s & CTs:

For CTs:

a. Verification of Terminal marking and polarity.
b. Power frequency dry withstand test on Primary Winding.
c. Power frequency dry withstand Test on Secondary Winding.
d. Over voltage inter turn test.
e. Determination of error or other characteristics according to requirements of the appropriate designation or accuracy class.

If the single item of the meter cabinet fails in RST, the inspected lot of that particular item supplied at various stores shall be rejected.

5 days advance information shall be given to supplier for joint inspection and the date shall not be altered to the convenience or request of supplier. If the supplier / supplier's representative fails to attend on the date fixed, the RST shall be carried out in his absence & results of RST shall be binding on supplier.

13.00 SCHEDULES:

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule „A' …. Guaranteed and technical particulars. (As per GTP uploaded on e -tendering site)

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard shall not be entertained. If it is observed that there are deviations in the offer in Guaranteed Technical Particulars, then, such deviations shall be treated as deviations.

ANNEXURE I

COMPONENT SPECIFICATION

The make/grade and the range of the components should be from the following list makes or equivalent reputed makes

Sr. No.	Component function	Requirement	Makes and Origin

1	Current Transformers	The Meters shall be with the current transformers as measuring elements.	The current transformer shall withstand for the clauses under of IS: 16444 part 2 / 2017.
2	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	**USA:** Analog Devices, Cyrus Logic, Atmel, Philips, Teridian. Dallas, ST, Texas Instruments, Motorola, Maxim, National Semiconductors, Freescale, Onsemiconductors **Germany:** Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria:** AMS **Holland:** Philips (N X P) **Taiwan:** Prolific Or any other reputed make.
3	Memory chips	The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. There shall be security isolation between metering circuit, communication circuit, and power circuit.	**USA:** Atmel, Teridian, Philips ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron. **Japan:** Hitachi, Renasas. **Germany:** Siemens Or any other reputed make.
4	Display modules	(a) The display modules shall be well protected from the external UV radiations. (b) The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters. (c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type). (d) It shall be trans- reflective	Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics **Singapore:** E-smart, Bonafied Technologies, Display Tech, **Korea:** Advantek, Jebon, Union Display Inc., **Japan:** Hitachi, Tianma, Sony, L&G, Holtek, Haijing. **Malaysia:** Crystal Clear Technology. **Hong kong:** Genda **China:** Success, Tianma. Or any other reputed make.

		HTN (Hyper Twisted Nematic (120°)) or STN (Super Twisted Nematic (160°)) type industrial grade with extended temperature range.	
5	Communication Modules	Communication modules shall be compatible for the two ports (one optical port for communication with meter reading instruments & the other hardwired RS 232 port to communicate with various modems for AMR)	**USA:** HP, Optonica, National Semiconductors, **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek. Or any other reputed make.
6	Optical port	Optical port shall be used to transfer the meter data to meter reading instrument. The mechanical construction of the port shall be such to facilitate the data transfer easily.	**USA:** HP, National Semiconductors, Maxim **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek. Or any other reputed make.
7	Power supply	The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	SMPS Type
8	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** National Semiconductors, Atmel, Philips, Texas Instruments, BC Component Analog devices, ST, Maxim, Siemens, PHYCOMP, YAGEO, DRALORIC, KOA, WELWYN, OSRAM, Kemet Onsemiconductors, Freescale, Intersil, Raltron, Fairchild, Muruta, Agilent, AVX, Abracon, Sipex, Diode

			Inc., Honeywell, Power Integration, Fox, Roham **Japan:** Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung, Panasonic **India:** Keltron, Incap, VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic components Pvt. Ltd., Cermet, CTR. **Korea:** Samsung **Germany:** Vishay, Epcos, Diotech, Kemet, Infineon **Taiwan:** Yageo. Or any other reputed make.
9	Mechanical parts	(i) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. (ii) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
10	Battery	Chargeable/Non chargeable maintenance free guaranteed life of 10 years.	**USA:** Maxell, Renata **Japan:** Panasonic, Sony, Mitsubishi, Sanyo **Germany:** Varta, Tedirum **France:** Saft **Korea:** Tekcell, Vitzrocell. Or any other reputed make.
11	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standards.	**USA:** Philips, Dallas Atmel, Motorola, Microchip, Epson, ST, Teridian **Japan:** NEC or Oki. Or any other reputed make.
12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

ANNEXURE – II

MSEDCL DEFINED OBIS CODES FOR PARAMETERS NOT PRESENT IN IS 15959/Part 3

SR. NO.	PARAMETERS	OBIS Code						Interface Class
		A	B	C	D	E	F	No./ Attribute
1.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)	1	0	5	8	1	255	3/2
2.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)	1	0	5	8	2	255	3/2
3.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)	1	0	5	8	3	255	3/2
4.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)	1	0	5	8	4	255	3/2
5.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)	1	0	8	8	1	255	3/2
6.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)	1	0	8	8	2	255	3/2
7.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)	1	0	8	8	3	255	3/2
8.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)	1	0	8	8	4	255	3/2

SCHEDULE 'A'

GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

ITEM NAME	**LT CT OPERATED ENERGY METERING CABINET OF SMC COMPRISING OF RESIN CAST BLOCK TYPE CTS, S AND LT AC THREE PHASE, FOUR WIRE 300/5 AMPS OR 400/5 AMPS OR 600/5 AMPS OR 800/5 AMPS CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI - VECTOR SMART ENERGY METER**	
SR. NO.	**GTP PARAMETERS**	**GTP VALUES**
A	**LT AC THREE PHASE, FOUR WIRE 400/5 AMPS OR 600/5 AMPS OR 800/5 AMPS CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI-VECTOR ENERGY METER AS PER CATEGORY D3**	
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TO BE FILLED BY MANUFACTURER
2.	MAKE AND TYPE OF METER	TO BE FILLED BY MANUFACTURER
3.	APPLICABLE STANDARDS	IS: : 16444 part 2 / 2017.
4.	METER BEARS ISI MARK	YES
5.	FREQUENCY	50 HZ ±5%
6.	ACCURACY CLASS OF METER	0.5S (FOR ACTIVE AND REACTIVE ENERGY)
7.	RATED VOLTAGE	415 V Ph-Ph or 240 V Ph-N
8.	VOLTAGE RANGE	+15% TO – 30% OF RATED VOLTAGE.
9.	CURRENT RATING	300/ 5 AMPS OR 400/ 5 AMPS OR 600/ 5 AMPS OR 800/ 5 AMPS
10.	BASIC CURRENT (IB) OF METER	5 AMPS
11.	MAXIMUM CONTINUOUS CURRENT (IMAX)	2 TIMES (200 %) Ib

12.	SHORT TIME OVER CURRENT	AS PER IS: : 16444 part 2 / 2017.
13.	STARTING CURRENT OF METER	0.1% of Ib
14.	POWER FACTOR RANGE	ZERO LAG TO UNITY TO ZERO LEAD
15.	POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT	As PER IS 16444
16.	POWER CONSUMPTION IN EACH CURRENT CIRCUIT	As PER IS 16444
17.	POWER SUPPLY IS SMPS & MICRO CONTROL TYPE	YES
18.	STANDARD REFERENCE TEMPERATURE OF METER	27^0 C
19.	MEAN TEMPERATURE CO-EFFICIENT	SHALL NOT EXCEED 0.03%.
20.	KVA MD PROVIDED	YES
21.	OPAQUE METER BASE & TRANSPARENT/OPAQUE TOP COVER IS MADE OUT OF UNBREAKABLE, TOUGH, NON-BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE MATERIAL SO AS TO GIVE IT AND QUALITIES.	YES
22.	METER BODY IS MADE OF POLYCARBONATE	YES
23.	POLY CARBONATE BODY OF METER CONFORMS TO IS: 11731 (FV-2 CATEGORY)	YES
24.	POLY CARBONATE BODY MEETS THE TEST REQUIREMENT OF (a) HEAT DEFLECTION TEST AS PER ISO 75 > 150^0C	YES
25.	(b) GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 2008 OR IEC PUB 60695-2-12 AT 900^0C	YES
26.	(c) BALL PRESSURE TEST AS PER IEC-60695-10-2	YES
27.	(d) FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986	YES
28.	TYPE TEST REPORT NOS. & DATE OF ABOVE (a) to (d)	TO BE FILLED BY MANUFACTURER

29.	PHYSICAL WATER ABSORPTION VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
30.	THERMAL HDDT VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
31.	TENSILE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
32.	FLEXURE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
33.	MODULUS OF ELASTICITY OF METER BODY	TO BE FILLED BY MANUFACTURER
34.	IZOD IMPACT STRENGTH OF METER BODY NOTCHED AT 23°C	TO BE FILLED BY MANUFACTURER
35.	POLY-CARBONATE OPAQUE BASE AND TRANSPARENT/OPAQUE TOP COVER IS ULTRA-SONICALLY/CHEMICALLY WELDED (CONTINUOUS WELDING)	YES
36.	THICKNESS OF MATERIAL FOR METER COVER & BASE	2 MM MINIMUM
37.	METER BODY TYPE TESTED FOR IP51 DEGREE OF PROTECTION AS PER IS: 12063 AGAINST INGRESS OF DUST, MOISTURE & VERMIN	YES
38.	IP51 DEGREE OF PROTECTION AS PER IS: 12063 TEST CERTIFICATE NO. & DATE	TO BE FILLED BY MANUFACTURER
39.	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS WITH TWO HOLES.	YES
40.	TERMINAL BLOCK IS MADE FROM HIGH QUALITY NON-HYGROSCOPIC, FIRE RETARDANT, REINFORCED POLYCARBONATE / NON-BAKELITE MATERIAL	YES
41.	MATERIAL OF WHICH THE TERMINAL BLOCK IS MADE IS CAPABLE OF PASSING THE TESTS GIVEN IN IS: 1336O (PART 6/SEC 17), ISO 75-1 (1993) & ISO 75-2 (1993) FOR A TEMPERATURE OF 135^{0}C AND A PRESSURE OF 1.8 MPA (METHOD A)	YES
42.	TYPE TEST REPORT NOS. & DATE OF ABOVE	TO BE FILLED BY MANUFACTURER
43.	TWO SCREWS ARE PROVIDED IN EACH CURRENT & POTENTIAL TERMINAL FOR EFFECTIVELY CLAMPING THE EXTERNAL	YES

	LEADS OR THIMBLES IN TERMINAL BLOCK	
44.	MINIMUM INTERNAL DIAMETER OF TERMINAL HOLE	TO BE FILLED BY MANUFACTURER
45.	TERMINATION ARRANGEMENT IS PROVIDED WITH AN EXTENDED TRANSPARENT TERMINAL COVER AS PER CLAUSE NUMBER 6.5.2 OF IS: 16444 part 2 / 2017. (AMENDED UPTO DATE) IRRESPECTIVE OF REAR CONNECTIONS	BOOLEAN
46.	TERMINAL COVER IS UNBREAKABLE, TOUGH, NON- BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE & IS MADE OF THE SAME MATERIAL AS THAT OF METER BODY	YES
47.	TERMINAL COVER IS TRANSPARENT	YES
48.	TERMINAL COVER ENCLOSES ACTUAL TERMINALS, CONDUCTOR FIXING SCREWS AND A SUITABLE LENGTH OF EXTERNAL CONDUCTORS AND THEIR INSULATION	YES
49.	TERMINAL COVER IS PROVIDED WITH ONE HINGE	YES
50.	INDEPENDENT SEALING PROVISION IS MADE AGAINST OPENING OF THE TERMINAL COVER AND FRONT COVER TO PREVENT UNAUTHORIZED TAMPERING	YES
51.	UNIDIRECTIONAL SCREWS WITH TWO HOLES FOR SEALING PURPOSE OF TERMINAL COVER ARE PROVIDE	YES
52.	FIXING SCREWS USED ON THE TERMINAL COVER FOR FIXING AND SEALING ARE HELD CAPTIVE IN THE TERMINAL COVER	YES
53.	PROPER SIZE OF GROOVES/U CUT PROVIDED AT BOTTOM OF TERMINAL COVER FOR INCOMING SERVICE CONNECTIONS	YES
54.	PUSH BUTTONS ARE PROVIDED AS PER SPECIFICATIONS	YES
55.	PROVISION TO PUT AT LEAST TWO SEALS BY UTILITY	YES
56.	PROVISION OF DISPLAY OF HIGH RESOLUTION READING / ALTERNATE MODE	YES

57.	OUTPUT DEVICE FOR TESTING OF METER IS BLINKING LED / LCD WITH CONSTANT PULSE RATE IS PROVIDED	YES
58.	RESOLUTION OF THE TEST OUTPUT DEVICE IS SUFFICIENT TO ENABLE THE STARTING CURRENT TEST IN LESS THAN 10 MINUTES	YES
59.	METER CONSTANT IS INDELIBLY PRINTED ON THE NAME PLATE OF THE METER	YES
60.	METER ACCURACY NOT AFFECTED BY AC / DC / PERMANENT MAGNETIC FIELD UPTO 0.27T TESLA	YES
61.	UNDER INFLUENCE OF ANY MAGNETIC FIELD ABOVE 0.27T TESLA, IF THE ERRORS ARE BEYOND PERMISSIBLE LIMITS, METER RECORDS ENERGY CONSIDERING IMAX AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	YES
62.	METER IS CAPABLE TO WITHSTAND & NOT GET DAMAGED IF PHASE TO PHASE VOLTAGE IS APPLIED BETWEEN PHASES & NEUTRAL FOR FIVE MINUTES	YES
63.	TYPE OF POWER SUPPLY UNIT	SMPS
64.	NON SPECIFIED DISPLAY PARAMETERS IN ARE BLOCKED AND NOT ACCESSIBLE FOR REPROGRAMMING AT SITE	YES
65.	CTS ARE PROVIDED WITH MAGNETIC SHIELDING AND ARE TESTED SEPARATELY PRIOR TO ASSEMBLY	YES
66.	COMPLETE METERING SYSTEM DOES NOT AFFECTED BY EXTERNAL ELECTROMAFNETIC INTERFERRENCE	YES
67.	REAL TIME QUARTZ CLOCK IS USED IN METER FOR MAINTAINING TIME (IST) AND CALENDAR	YES
68.	RTC BATTERY & BATTERY FOR DISPLAY ARE SEPARATE	YES
69.	RTC BATTERY IS NON –RECHARGEABLE TYPE	YES
70.	RTC PRE - PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR	BOOLEAN

	CORRECTION	
71.	MAXIMUM DRIFT TIME OF RTC PER YEAR	SHALL NOT EXCEED +/- 300 SECONDS PER YEAR
72.	DAY / DATE SETTING & SYNCHRONISATION POSSIBLE THROUGH PASSWORD / KEY CODE	YES
73.	METER WITHSTANDS ANY TYPE OF HIGH VOLTAGE & HIGH FREQUENCY SURGES WHICH ARE SIMILAR TO THE SURGES PRODUCED BY INDUCTION COIL TYPE INSTRUMENTS WITHOUT AFFECTING THE ACCURACY OF THE METER	YES
74.	ACCURACY OF METER IS NOT AFFECTED WITH APPLICATION OF ABNORMAL VOLTAGE / FREQUENCY GENERATING DEVICE SUCH AS SPARK DISCHARGE OF APPROXIMATELY 35 KV	YES
75.	SPARK DISCHARGE OF APPROXIMATELY 35KV CARRIED OUT	YES
76.	METER LOGS UNSATISFACTORY OR	YES
77.	METERING PROTOCOL AS PER TECHNICAL SPECIFICATION	YES
78.	OPTICAL PORTS FOR COMMUNICATION AND communication module WITH SEALING ARRANGEMENT ARE PROVIDED	YES
79.	DEFAULT & MINIMUM BAUD RATE OF OPTICAL PORTS	9600 BPS
80.	INTERNAL NI-MH OR LI-ION OR NI CD MAINTENANCE FREE BATTERY OF LONG LIFE OF 10 YEARS WITH PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY OR EXTERNAL BATTERY WITH INDUCTIVE COUPLING ARRANGEMENT WITH INBUILT CHARGER IN THE RATIO OF 1 BATTERY PACK PER 50 NOS. OF METERS PROVIDED	YES
81.	METER PCB IS WIRE LESS & IS MADE BY	SURFACE MOUNTING TECHNOLOGY
82.	METER RECORDS & DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY	YES

83.	NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED	YES
84.	6 (SIX) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED	YES
85.	PROVISION FOR MD INTEGRATION PERIOD OF 30 MINUTES IS MADE	YES
86.	PROVISION THROUGH COMMUNICATION L	YES
87.	PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED	YES
88.	PROVISION FOR AUTO RESET OF MD AT CERTAIN PREDEFINED PERIOD (00 Hrs) IS PROVIDED	YES
89.	ALL ANTI TAMPER FEATURES ARE PROVIDED AS PER SPECIFICATION	YES
90.	METER LOGS TAMPER EVENTS AS PER SPECIFICATION	YES
91.	DETECTION OF TAMPER NO. & TAMPER EVENT IS REGISTERED IN TAMPER EVENT REGISTER	YES
92.	METER KEEPS RECORD OF TAMPER EVENTS FOR MINIMUM 300 EVENTS ON FIFO BASIS	YES
93.	SUPPLY INDICATION IN THE FORM OF LED / LCD DISPLY IS PROVIDED	YES
94.	SUPPLY INDICATION IS VISIBLE FROM THE FRONT OF THE METER	YES
95.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF MINIMUM 6 DIGITS AND MINIMUM 10 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED	YES
96.	SIZE OF DIGITS	MINIMUM 10X5 MM
97.	AUTO DISPLAY CYCLING PUSH BUTTON WITH PERSISTENCE TIME OF 9 SECONDS IS PROVIDED	YES
98.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF 70^0C	YES

99.	PUSH BUTTON FOR HIGH RESOLUTION DISPLAY / ALTERNATE MODE OF DISPLAY IS PROVIDED	YES
100.	METER IS PROGRAMMED FOR (A) MD INTEGRATION PERIOD OF 30 MINUTES	YES
101.	(B) AVERAGE POWER FACTOR WITH 2 DECIMAL DIGITS	YES
102.	(C) AUTO RESET KVAMD AT 24.00 HRS. OF LAST DAY OF THE MONTH AS PER CLAUSE 10.00 (III) OF SPECIFICATION	YES
103.	(D) ARRAY OF DATA TO BE RETAINED INSIDE THE METER MEMORY FOR THE LAST 60 DAYS FOR A CAPTURE PERIOD OF 30 MINUTES ON FIRST IN FIRST OUT BASIS (FIFO)	YES
104.	SEQUENCE OF DISPLAY PARAMETERS IS AS PER SPECIFICATIONS	YES
105.	METER RECORDS & DISPLAYS THE QUANTITES AS PER SPECIFICATION	YES
106.	DISPLAY OTHER THAN SPECIFIED IS BLOCKED	YES
107.	OTHER KVA MD VALUES ARE AVAILABLE IN RESET BACKUP DATA FOR 12 MONTHS.	YES
108.	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF 'PUSH BUTTON' IS NOT OPERATED FOR 15 SECONDS	YES
109.	BILLING DATA IS AS PER SPECIFICATION	YES
110.	PROVISION FOR RECORDING HISTORY OF BILLING PARAMETERS FOR LAST 12 MONTHS	YES
111.	PROVISION FOR LOAD SURVEY DATA FOR EVERY 30 MINUTES AND FOR PREVIOUS 60 DAYS FOR SPECIFIED PARAMETERS ON FIFO BASIS	YES
112.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: : 15959 part 3: 2017 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES

113.	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY	YES
114.	DOWNLOADING SOFTWARE IS PROVIDED TO INSTALL ON OUR LAPTOP FOR DOWNLOADING DATA DIRECTLY ON LAPTOP FROM METER WITHOUT THE USE OF HHT	YES
115.	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 60 DAYS	SHALL BE LESS THAN OR EQUAL TO 8 MINUTES
116.	DOWNLOADING TIME OF ONLY BILLING DATA	LESS THAN OR EQUAL TO 20 SECS
117.	PERMANENT NATURE CONNECTION DIAGRAM OF THE METER IS CLEARLY SHOWN ON INSIDE PORTION OF THE TERMINAL COVER	YES
118.	DISTINCTLY MARKED NAME PLATE WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS, CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL IS PROVIDED ON METER	YES
131.	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER	YES
132.	CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE IS PROVIDED ON METER	YES
133.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: : 15959 part 3: 2017 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
134.	CATEGORY OF METER AS "CATEGORY D 3 – LT CT CONSUMER METER" IN 3 MM BOLD FONT IS MARKED ON NAME PLATE	YES
135.	WHETHER METER IS TYPE TESTED	YES
136.	TYPE TEST REPORT NOS. & DATE OF METER	TO BE FILLED BY MANUFACTURER
137.	METER PROTOCOL REPORT NOS. & DATES	TO BE FILLED BY MANUFACTURER
	ALL ACCEPTANCE & ROUTINE TESTS, AS PER	YES

138.	IS: 16444 Part 3 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY	
140.	METER ARE GUARANTEED AS PER TENDER DOCUMENT (YES/NO)	YES
141.	GUARANTEE TO REPLACE METERS FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES
142.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	TO BE FILLED BY MANUFACTURER
143.	IN HOUSE TESTING FACILITY IS AVAILABLE FOR (A) AC VOLTAGE TEST	YES
144.	(b) INSULATION RESISTANCE TEST	YES
145.	(c) ACCURACY REQUIREMENT	YES
146.	(d) TEST ON LIMITS OF ERRORS	YES
147.	(e) TEST ON METER CONSTANT	YES
148.	(f) TEST OF STARTING CONDITION	YES
149.	(g) TEST OF NO-LOAD CONDITION	YES
150.	(h) REPEATABILITY OF ERROR TEST	YES
151.	(i) TEST OF POWER CONSUMPTION	YES
153.	(k) TAMPER CONDITIONS AS PER MSEDCL SPECIFICATION	YES
154.	(l) GLOW WIRE TEST	YES
155.	(m) LONG DURATION TEST	YES
156.	(n) FLAMABILITY TEST	YES
157.	(o) MANUFACTURER HAVE DULY CALIBRATED RSS METER OF CLASS	YES

	0.1 ACCURACY	
158.	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	YES
159.	AGEING TEST FOR 72 HOURS AT 55^{0}C TEMPERATURE AND ATMOSPHERIC HUMIDITY UNDER REAL LIFE CONDITION AT FULL LOAD CURRENT TO ELIMINATE INFANT MORTALITY IS CARRIED OUT	YES
160.	COMPONENT SPECIFICATION AS PER SPECIFICATION	YES
B	**RESIN CAST RING TYPE LT CT**	
161.	TYPE	RESIN CAST BLOCK TYPE
162.	APPLICABLE STANDARD	IS 16227 (Part I & Part II)
163.	RATED CURRENT	300/5 A OR 400/5 A OR 600/5 A OR 800/5 A
164.	RATED SHORT TIME CURRENT	25 KA FOR 1 SECONDS
165.	RATED VOLTAGE	415 Volts
166.	FREQUENCY	50 Hz
167.	VA BURDEN	5 VA
168.	ISF OF CT	≤ 5
169.	CLASS OF ACCURACY	0.5S
170.	PRIMARY WOUND TYPE	TO BE FILLED BY MANUFACTURER
171.	NAME PLATE BODY	TO BE FILLED BY MANUFACTURER
172.	CURRENT DENSITY	MAX 1.6 AMPS/SQ.MM
173.	NUMBER OF PRIMARY TURNS	TO BE FILLED BY MANUFACTURER
174.	NUMBER OF SECONDARY TURNS	TO BE FILLED BY MANUFACTURER
175.	COLOUR OF CT'S	TO BE FILLED BY MANUFACTURER

176.	WHETHER TYPE TESTED	TO BE FILLED BY MANUFACTURER
177.	TYPE TEST REPORT NOS	TO BE FILLED BY MANUFACTURER

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

THREE PHASE ENERGY METER BOX SUITABLE FOR AUTOMATIC METER READING (AMR) OF DISTRIBUTION TRANSFORMER CENTRE (DTC) WITH CURRENT TRANSFORMERS

1.0 SCOPE:

This specification covers design, manufacturing, testing at works and supply of Meter that shall be made out of CRCA M.S. Sheet confirming to IS: 13947 or Sheet Moulding Compound (SMC) confirming to IS: 13410 / 1992 amended upto date & IS: 14772 / 2000 (amended upto date) for use in electrical distribution system in Maharashtra. The system shall be AC three phase, four wires, 415 V, 50 Hz with effectively grounded neutral. The Meter Box shall be suitable for housing LT AC Three Phase Four Wire CT operated Static TOD Tri - Vector Energy Meters with single phase resin cast ring type CTs and modem & antenna in indoor as well as outdoor applications.

2.0 SERVICE CONDITION:

The Meter Box to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions.

Max. & ambient air temperature	50 degree C
Max. relative humidity	100%
Max. annual rainfall	1450 mm
Max. wind pressure	150 Kg/Sq.m
Max. altitude above mean sea level	1000 mtrs
Seismic level (Horizontal acceleration)	0.3 g
Isoceraunic level	50 days/year
Climatic condition	Moderately hot and humid Tropical climate conducive to rust and fungus growth
Ambient temperature for temperature rise	50 deg.C

3.0 APPLICABLE STANDARDS:

Unless otherwise modified in this specification, the meter box shall generally confirm with the provisions of IS: 14772 / 2000 (Amended upto date) and material of construction i.e. for SMC to IS: 13410 / 1992 & for M.S Sheet to IS: 13947 & requirement of this specification.

4.0 DESIGN & CONSTRUCTION:

4.1 The meter box shall be made by DEEP drawn process confirming to the requirements of IS: 13947 or from thermosetting plastic i.e. glass reinforced polyester sheet moulding compound Grade S-3 confirming to IS: 13410 / 1992, & requirement of this specification

4.2 The boxes shall be made by Hot Press compression moulding Process

4.3 The base and cover of meter box shall be individually in one piece except for fixing of accessories like hinges, clamp, handles etc

4.4 The meter box shall be so constructed as to have roof tapering down for easy flow of rainwater.

4.5 The box / cover shall be drawn from CRCA M.S. Sheet metal thickness not less than 2 mm. Alternatively, if SMC is used then the Meter Box shall be moulded using 100% virgin SMC, grade S-3 material. The box shall be weather proof, unbreakable and scratch resistant & shall have good workmanship. For SMC, the wall thickness of the meter box base shall be minimum 3.0 mm on load bearing side and 2.00 mm on all other sides, thickness of cover shall be minimum 2 mm

4.6 The surface of the Meter Box made from CRCA M.S. Sheet shall be properly pre-treated / phosphated in 7-tank process and shall be applied with a powder coating of 40 micron thickness on outer side and inside, Powder coating shall be of smoke grey colour. Powder coating shall be weather proof & corrosion resistant and suitable for outdoor usage.

4.7 The SMC meter box shall be made of anti corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant high grade SMC material having good dielectric and mechanical strength property.

4.8 The surface appearance or part of meter box must be smooth, non porous and homogeneous, free from ripples, defects and marks. No fillers or fibres shall be visible at any place.

4.9 The meter box shall have base raised by about 20 mm in the box for easy wiring for fixing the meter, modem and antenna. The meter screws shall not protrude outside.

4.10 The Meter Box shall facilitate wireless data communication with minimal disruption for AMR purpose

4.11 A partition shall be provided inside the base such that box is divided in two parts. The lower partition shall house the single phase resin cast ring type CTs and the upper partition shall house the LT CT operated Static TOD Tri-Vector Energy Meter, modem & the antenna

4.12 The box shall be provided with two separate doors.

4.13 Three holes with rubber glands of I.D. 15 mm. shall be provided in the partition sheet for Secondary CT wires and potential terminal wires along with neutral.

4.14 The boxes shall be suitable for outdoor application.

4.15 Corners of the Meter Box shall be round and not pointedones.

4.16 Doors with locking arrangement shall be provided.

4.17 The minimum inside dimensions of the meter box shall be suitable for installation of all types of meters purchased from various meter manufacturers.

4.18 The meter box shall be such that there shall be minimum 100 mm clearance at the bottom, 75 mm clearance on all three sides, 25 mm clearance at the front and 20 mm clearance at the back between the meter and meter box innerwall.

4.19 The provision of installation of modem shall be above 75 mm from the meter top side

4.20 Hinges, locking arrangement shall be of stainless steelonly.

4.21 For SMC, the base and cover must be UV stabilized to ensure that it does not get „Yellow" over a period of time. It shall not change in colour, shape, size, dimensions when subjected to 200 hrs on UV ageing test as per ASTM: G53 (Cl. No. 9.3), 4 Hours UV at 60^0 C and 4 Hours Condensation at 50^0 C. The base and cover shall be capable of withstanding temperature of boiling water for five minutes continuously without distortion or softening.

4.22 Each cover of Box shall be fixed on two-tamper proof inside hinges not visible from outside. Hinges shall be made of 2.5 mm M.S. sheet and shall be 40 mm in length for lower partition and 60 mm in length for upper partition. The hinges / strip hinges for compartment cover shall be so designed that the door cannot be opened without breaking the seals, i.e. the hinges / strip hinges shall be provided frominside.

4.23 The door of Box shall open from right to left by 90^0. Collar of each door (cover) in closed position shall rest on the collar of the body (base) of Box. The collar of the door shall overlap the collar of the body of Box by 8 mm such that direct entry of screwdriver, tool or film is not possible. The cover shall be provided with semi circular / circular gasket of 4 mm thickness to completely fit to the base. The gasket shall be made out of good quality neoprene rubber. Thickness of rubber lining shall be such that it provides proper sealing between the cover & base of Box to avoid penetration of dust & ingress of water.

4.24 The enclosure shall comply with the requirements of IP – 55 for SMC & IP – 55 for CRCA M.S. Sheet as per IS: 12063 or the latest version thereof.

4.25 Rubber lining should be fixed with suitable adhesive so that the same does not get removed by itself on opening of the door.

4.26 Two numbers U-shaped latch arrangement shall be provided to each compartment to lock / seal the cover with base. A hole of 2 mm diameter shall be provided on U-shaped latch for sealing wires and additional hole of 8 mm shall be provided in the latch for locks. All holes should be aligned when latch is in closed position.

4.27 For meter reading and modem viewing, the box shall have two windows with Toughened / Triplex Glass Fixed with stainless steel frame from inside about 70 mm below top edge of cover for modem. The second window shall be 75 mm below the lowest edge of modem window. Glass shall have scratch proof "MSEDCL" logo on the right side top comer of the glass. This glass shall be fixed from inside of the cover of Meter Box, with single piece metal frame (Glass Holder) fixed with minimum four screws. The glass has to be fitted with a wrap around single piece rubber ring without joint made from good quality neoprene rubber so that it can withstand weather effect. The box shall have windows of size as per the table given below provided with Glass.

Particulars	Window for Meter (mm)	Window for Modem (mm)
Height (H)	160	120
Width (W)	140	140
Thickness (T)	5	5

4.28 The mounting arrangement of the meter and modem and antenna in the meter box shall be by way of adjustable slotted polymeric brackets / strips which shall be fixed on the base or moving slotted flat. The mounting arrangement shall be raised from the base of Box body by 20 mm. CT mounting plates shall be fixed with 2 screws & shall be provided as per the Drawings. For mounting of various makes of meter and modem & antenna, the supplier shall supply seven mounting MS screws, one for upper (M4 threads x length 12 mm) and six screws (M4 threads x 35 mm length with nut) in moving slotted flat. The mounting arrangement of the meter, modem, antenna & CTs shall be indicated by the Bidder through Drawings.

4.29 For mounting the box on pole, four strips of L-shape shall be welded / fixed on the box. Strips shall be 40 mm wide & 3 mm thick of M.S. sheet

4.30 4 Nos. holes with superior quality rubber cable glands of internal diameters 30 mm each for incoming and outgoing cables shall be provided at both the side walls of the box for passing of cable through CTs. Rubber glands shall be fixed with suitable adhesive so that the same do not get removed. Rubber glands shall be made such that internal diameter of glands should be closed with the rubber film of approximately 3 mm thickness. Cable will go through the cable glands by cutting the rubber film of the glands.

4.31 Four primary cables, connectors of Aluminium shall be provided with the box. Primary cable connectors shall be used for tapping main cable and providing primary wires for voltage supply to the meter. Each cable connector shall consist of two aluminium strips of size 10 mm x 55 mm. Both strips will have holes at the ends to clamp with cable by screws and nuts. The supplier shall supply four sets of cable connectors with 4 mm^2 cables crimped with suitable lugs at both ends complete with screws and nuts. The cable connectors shall be insulated from outer sides with epoxy insulation of 2 mm thickness.

4.32 Handles shall be provided to the doors to open and close the doors.

4.33 One Earthing Bolt of size M8 x 25 mm fitted with the box from inside, shall be provided for external earthing with 2 plain washers, one spring washer & two nuts. Earthing bolt shall be property zinc plated. All the screws and washers shall be properly zinc plated.

4.34 The tolerance permissible on the overall dimensions of the Box shall be (+/-) 2%. However, the tolerance for the fittings shall be (+/-) 3%

4.35 The minimum internal dimensions of the meter box shall be 1000 mm height (H) x 350 mm width (W) x 230 mm depth (D)

4.36 Colour of the SMC meter box shall be Siemens Gray.

5.0 TESTS & TEST CERTIFICATES:

The meter box shall be fully type tested in accordance with the relevant standards and as per MSEDCL requirement. All the Type Tests specified in the technical specifications shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as CIPET, EQDC, ERDA, ERTL, CPRI, etc. to prove that equipments meet the requirement of the specification.

The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per respective IS.

The tenderer shall also furnish certificate from laboratories where type tested that required test facility available in-house for that particular test. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The Box shall be fully type tested as per IS: 14772/2000 (amended up to date) and IS: 13410 / 1992 (amended up to date) or as per IS: 13947and as per requirement of this specification. The type test report shall clearly indicate the constructional features identifying material of construction and its grade / composition as per respective IS and other type tests as well as acceptance tests as per table.
The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost. All the type test reports shall be got approved from the Chief Engineer (Testing & Quality Control), MSEDCL, 5th Floor, Prakashgad, Bandra (E), Mumbai – 400 051 as per tender conditions.

The type test reports of M S Sheet Meter Box as given below shall be furnished with certified drawings to prove that equipment offered meets the requirement of the specification.

Type Tests for M.S. Sheet Meter Box:

Sr. No.	Test	Reference Standard	Required Value
1	Marking	IS 14772:2000, Cl. 7	Manufacturer Name & Danger Logo Screen Printing
2	Dimensions	IS 14772:2000, Cl. 8	As per specification and drawing
3	Protection against Electric Shock	IS 14772:2000, Cl. 9	As per IS
4	Provision for Earthing	IS 14772:2000, Cl. 10	As per IS
5	Construction	IS 14772:2000, Cl. 11	No Crack or Damage
6	Resistance to Ageing, to humid condition, to ingress of solid objects and to harmful ingress of water	IS 14772:2000, Cl. 12	No Crack or Damage
7	Mechanical Strength	IS 14772:2000, Cl. 13	No Crack or Damage
8	Resistance to Heat	IS 14772:2000, Cl. 14	No ball impression
9	Resistance to Insulating Material to Abnormal Heat and Fire	IS 14772:2000, Cl. 15	No Flame and Glowing
10	Resistance to Rusting	IS 14772:2000, Clause No. 16	No sign of rust observed
11	Resistance to Tracking	IS 14772:2000, Clause No. 17	No failure or breakdown occurs before 50 Drops 175V
16	Degree of Protection (IP-55)	IS:13947:1993 (Part-1)	IP-55

17	Thickness of Box	-	Other side Min. 2 mm, Base 3 mm
18	Powder Coating Thickness	-	40 Micron
19	Temperature rise test	IS: 8623 / 1993 amended upto date	As per IS

Type Tests for SMC Meter Box:

Sr. No.	Test	Reference Standard	Required Value
1	Marking	IS 14772:2000, Cl. 7	Manufacturer Name & Danger Logo Screen Printing
2	Dimensions	IS 14772:2000, Cl. 8	As per specification and drawing
3	Protection against Electric Shock	IS 14772:2000, Cl. 9	As per IS
4	Provision for Earthing	IS 14772:2000, Cl. 10	As per IS
5	Construction	IS 14772:2000, Cl. 11	No Crack or Damage
6	Resistance to Ageing, to humid condition, to ingress of solid objects and to harmful ingress of water	IS 14772:2000, Cl. 12	No Crack or Damage
7	Mechanical Strength	IS 14772:2000, Cl. 13	No Crack or Damage
8	Resistance to Heat	IS 14772:2000, Cl. 14	No ball impression
9	Resistance to Insulating Material to Abnormal Heat and Fire	IS 14772:2000, Cl. 15	No Flame and Glowing
10	Resistance to Rusting	IS 14772:2000, Clause No. 16	No sign of rust observed
11	Resistance to Tracking	IS 14772:2000, Clause No. 17	No failure or breakdown occurs before 50 Drops 175V
12	HeatDeflection Temperature @ 1.8 Mpa (On Enclosure)	IS 13411:1992	> 150
13	Exposure to Flame	IS 4249:1967	Self Extinguishing
14	Flammability	UL-94/IS-11731	V0
15	Melting Point	IS:13360 (Part-6/Sec-10):1992	Does not melt upto 400^0 C
16	Degree of Protection (IP-55)	IS:13947:1993 (Part-1)	IP-55

17	Glow wire test at 960 Deg. C	IS:11000	No flame and glowing observed
18	Ball Pressure Test	IEC-335	No Ball Impression Observed
19	UV Ageing Test for 300 Hours	ASTM-G-53	No Colour Change, no chalking and No discoloration observed
20	Water Absorption	IS:13411-1992	< 0.25%
21	Material Identification	As per Laboratory Method	Glass reinforced polyester Sheet Moulding compound (SMC)
22	Glass content, percent by mass (Min.)	IS:13410-1992	20
23	Water Absorption, % Max	IS:13410-1992	0.20
24	Izod impact strength (Notched), KJ/m^2	IS:13410-1992	55
25	Flexural Strength ,MPa , Min	IS:13410-1992	170
26	Power Arc Resistance Sec. Min.	IS:13410-1992	180
27	Modulus of Elasticity, 10^3 , MPa	IS:13410-1992	12 to 15
28	Tracking Resistance CTI, Min	IS:13410-1992	1000
29	Dielectric Strength at 90°C in Oil KV/mm	IS:13410-1992	11
30	Dissipation factor (4 days at 80 % RH & 1 KHz)	IS:13410-1992	0.01
31	Heat Distortion Temperature, °C ,Min	IS:13410-1992	150
32	Oxygen Index,% Min	IS:13410-1992	24

6.0 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of Meter box in schedule 'A' attached (As per Guaranteed Technical Particulars uploaded on e - Tendering site). The offers without the details in Schedule 'A' stand rejected.

7.0 TESTING & MANUFACTURING FACILITIES:

The Tenderer must clearly indicate the details of testing facilities available in the works of manufacturer and whether the facilities are adequate to carry out all the Routine and Acceptance tests. These facilities shall be available to MSEDCL Engineers, if deputed to

carry out or witness the tests in the manufacturer's works. The tenderer must have all in-house testing facility to carry out acceptance & routine tests on the meter box as per relevant IS. If any test cannot be carried out in the manufacturer works, the same shall be clearly stated. All testing equipments shall be duly calibrated in the NABL approved laboratories. The Bidder shall have the testing facility of flammability test of V0 for SMC Meter Box.

8.0 MANUFACTURING FACILITIES:

The CRCA M.S. Sheet Meter Box manufacturer shall have following minimum manufacturing facilities in-house to prove his reliability as a manufacturer of Energy Metering Box.

(a) Power operating shearing machine.
(b) Welding machines.
(c) Assembling tools.
(d) Assembly lines for fabrication and fitting.

The tenderer shall furnish detailed process of painting. In case the painting is to be carried out from outside agency, the tenderer shall furnish the facilities available with sub-contractor.

If SMC Meter Box is offered, the tenderer shall have the following minimum manufacturing facilities in house to prove his reliability as a manufacturer of Energy Metering Box.

(a) SMC material manufacturing machine
(b) Hydraulic press for hot press compression moulding
(c) Assembly lines for fabrication and fitting

9.0 GUARANTEE:

The instrument shall be guaranteed for the period of Five years from the date of Dispatch.

10.0 MARKINGS:

The meter box shall have an indelibly and distinctly marked with all essential particulars as per relevant standards. In addition to the requirement as per relevant standard, following information shall clearly & indelibly be embossed on the cover of the meter box.

a) Purchase order number and date
b) Year and month of manufacture
c) Name of Purchaser: MSEDCL
d) Guarantee: 5 years
e) Name and trademark of manufacturer
f) Danger logo (Screen Printed)

11.0 PACKING:

The meter box shall be suitably packed in corrugated boxes in order to avoid damage during transit or handling.

12.0 SCHEDULES:

The tenderer shall fill in the following schedules which are part and parcel of the tender specification and offer and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule 'A' – Guaranteed Technical Particulars

The discrepancies, if any, between the specification and the catalogues and/or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard will not be entertained.

13.0 DRAWINGS:

The successful bidder shall submit set of all above drawings of the distribution box and its components shall be submitted in triplicate to Chief Engineer (Testing & QC) office and get approved before commencement of supply.

TECHNICAL SPECIFICATIONS OF L.T. CURRENT TRANSFORMERS

1.0 **Scope:** Specification covers the design, manufacture, Testing at works and supply of L.T. current transformers for use in connection with L.T. C.T. operated energy metering box in Electrical Distribution system in the State of Maharashtra. The system shall be A.C. 3 phase, 4 Wire, 415 Volts, 50 HZ with effectively grounded neutral.

2.0 **Applicable standards:** the C.T. shall confirm to IS: 16227 (Part I & Part II) amended upto date.

3.0 **General Technical particular**:

3.01 Current transformer should be resin cast, ring type construction. Construction shall be single phase single core type. The internal diameters of the C.T. shall be in relevant with current ratings and as per requirement of current carrying capacity. For carrying out Short Time current test the primary shall be considered as fixed bar primary. The current density for copper bus-bar for primary shall be 1.6A sq.mm at primary rated current.

3.02 Suitable mounting robust clamp as per manufacturer design shall be provided.

3.03 Secondary terminal shall be of brass stud type. The size shall be minimum 6.0 mm dia 20 mm outside length with spring washer and double nuts.

3.04 Current ratio of - / 5 A as per the requirement continuous maximum current shall be 120%.

3.05 Rated voltage shall be Single Phase 240 V line to neutral

3.06 Accuracy class of 0.5 as per IS.

3.07 Rated burden shall be of 5 VA.

3.08 Limits of Error (Current) : As per IS: 16227

3.09 Limits of Error (Phase displacement) : As per IS:16227

3.10 Power frequency withstand voltage : 3 kV rms for 1 minute

3.11 Short time withstand current / duration 25 kA for 1 Seconds

3.12 Temperature rise (Maximum) 70° C

3.13 The instrument security factor shall be less than or equal to 5.

3.14 The ratio, name of manufacture / monogram and year of manufacturing shall be

engraved on the body of C.T. In addition name plate of anodized aluminum indicating the necessary details, year of manufacture etc. engraved on it shall be provided in such a manner that the information is clearly visible after mounting.

3.15 The secondary and primary terminals shall be clearly marked as S1 & S2.

3.16 The bidders should submit the drawings of offered CTs

4.0 Name Plate & Marking

Current transformer shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant stand. In addition to the requirement as per relevant standard following shall be marked on the name plate.

1. Purchase order No.
2. Month and year of manufacture
3. Name of purchaser i.e. M.S.E.D.C.L.
4. Five years Guarantee.

5.0 Type tests:

The tenderer shall furnish detailed type test reports of the offered L.T. Current transformers along with offer for all the tests as per relevant standards. All the above type tests shall be carried out at laboratories which are accredited by the national Accreditation Board of Testing and Calibration Laboratories (NABL) of Government of India to prove that the Current transformers offered meet the requirements of the specification. These tests should have been carried out with 5 years prior to the date of opening of this tender.

The purchaser reserves the right to demand repetition of some or all the Type Tests in presence of purchaser's representative at purchasers cost. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However such unit rates will not be considered for evaluation of the offer. In case the unit fails in the a type tests the complete supply shall be rejected.

The complete type tests enumerated in following table as per relevant IS: 16227 (Part 1 & 2) amended up to date shall be submitted and got approved from the Office of the Chief Engineer, Testing & Quality Control Cell, MSEDCL, 5th Floor, Prakashgad,

Bandra (E), Mumbai – 400 051 as per the tender conditions.

Sr. No.	Name of Test.
1)	Over Voltage Inter-Turn Test
2)	Verification of Terminal Marking & Polarity
3)	Determination of Errors according to the requirements of the appropriate accuracy class
4)	Lightning Impulse Voltage Withstand test
5)	Power Frequency Dry Withstand Test on Primary Winding
6)	Power Frequency Dry Withstand Test on Secondary Winding
7)	Temperature rise test
8)	Instrument Security Factor Test
9)	Short Time Current Test

6.0 **Acceptance Test:** All acceptance tests as per IS: 16227 (Part I & Part II) amended upto date

7.0 **Routine Test:** All routine tests as per IS: 16227 (Part I & Part II) amended upto date

8.0 **Guaranteed Technical Particulars:** The tenderer should also furnish the particulars giving specific required details of CTs in Schedule "A" attached. The offers without the details in Schedule "A" stand rejected.

9.0 **Drawing:** The bidder should submit the detail constructional drawing of the CTs along with the offer. The successful bidder should submit & get approved the drawing from the Chief Engineer, Testing & Quality Control Cell as per tender conditions

10.0 **Guarantee:** The CTs shall be guaranteed for the period of five years from the date of commissioning or five and half year from the date of dispatch whichever is earlier.

GUARANTEED TECHNICAL PARTICULARS OF THREE PHASE METER BOX

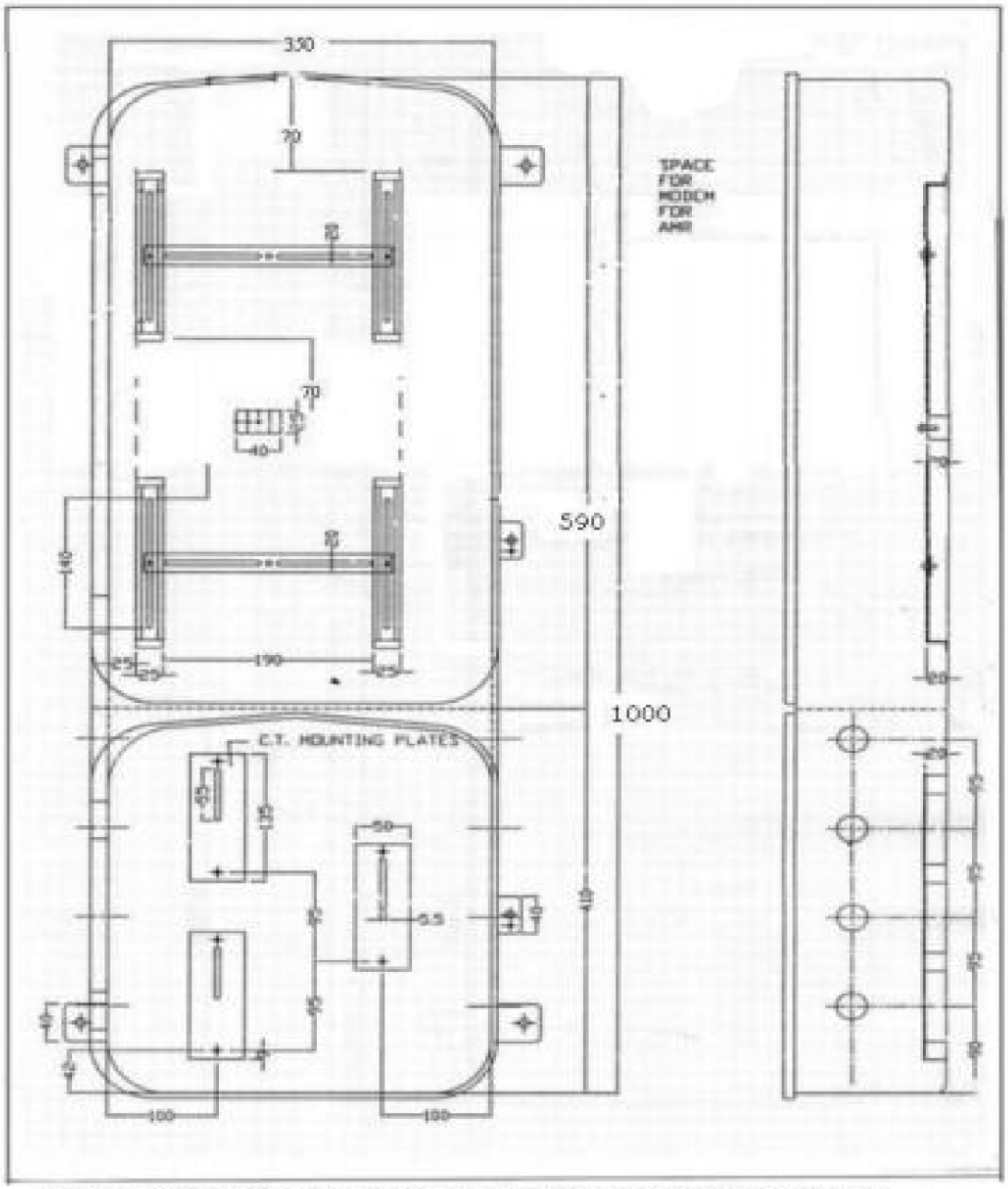
ITEM NAME	THREE PHASE ENERGY METER BOX SUITABLE FOR AUTOMATIC METER READING (AMR) OF DISTRIBUTION TRANSFORMER CENTRE (DTC)	
SR. NO.	GTP PARAMETERS	GTP VALUES
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TEXT
2.	APPLICABLE STANDARDS	TEXT
3.	TYPE OF METER BOX, CRCA M.S. SHEET OR SMC	TEXT
4.	IF CRCA M.S. SHEET, (A) METER BOX IS PROVIDED WITH DEEP DRAWN PROCESS (YES / NO)	BOOLEAN
5.	(B)METER BOX PRE-TREATED / PHOSPHATED IN 7-TANK PROCESS (YES / NO)	BOOLEAN
6.	(C) SMOKE GREY COLOURED POWDER COATING OF 40 MICRON THICKNESS ON INNER & OUTER SIDE PROVIDED (YES / NO)	BOOLEAN
7.	(D) POWEDER COATING IS WEATHER PROOF & CORROSION RESISTANT & SUITABLE FOR OUTDOOR USE (YES / NO)	BOOLEAN
8.	(E) METER BOX COMPLIES WITH THE REQUIREMENTS OF IP – 55 (YES / NO)	BOOLEAN
9.	(F) THICKNESS OF METER BOX	TEXT
10.	IF MADE FROM THERMOSETTING PLASTIC, I.E. GLASS REINFORCED POLYESTER SHEET MOULDING COMPOUND GRADE S-3, (A) METER BOX CONFIRMS TO IS: 13410 / 1992 & REQUIREMENTOF THIS SPECIFICATION(YES /NO)	BOOLEAN

11.	(B) METER BOX MADE BY HOT PRESS COMPRESSION MOULDING PROCESS (YES / NO)	BOOLEAN
12.	(C) WHETHER SMC GRADE S3 IS USED FOR CONSTRUCTION OF METER BOX. (YES / NO)	BOOLEAN
13.	(E) SMC MATERIAL USED IS UV STABILIZED. (YES / NO)	BOOLEAN
14.	CONFIRM FLAMMABILITY AS V2 AS PER UL 94 / IS 1173 (YES /NO)	BOOLEAN
15.	CONFIRM HEAT DEFLECTION TEMPERATURE OF BASE > 150^0C @ 1.8 MPA AS PER IS:13411, ANNEXURE „H" / ISO75 (YES /NO)	BOOLEAN
16.	DOORS HAVE LOCKING ARRANGEMENT (YES /NO)	BOOLEAN
17	MODEM CAN BE INSTALLED IN THE BOX ABOVE 75 MM FROM THE METER TOP SIDE (YES /NO)	BOOLEAN
18.	MINIMUM INTERNAL DIMENSIONS OF METER BOX HX W X D	TEXT
19.	SHEET THICKNESS OF BASE OF METER BOX AT LOAD BEARING SIDE	TEXT
20.	SHEET THICKNESS OF BASE OF METER BOX EXCEPT AT LOAD BEARING SIDE	TEXT
21.	SHEET THICKNESS OF COVER OF METER BOX	TEXT
22.	MINIMUM INTERNAL DIMENSIONS OF THE METER BOX	TEXT
23.	DOOR WITH LOCKING ARRANGEMENT IS PROVIDED (YES / NO)	BOOLEAN
24.	INSIDE DIMENSIONS OF METER BOX ARE SUITABLE FOR INSTALLATION OF ALL TYPES OF METERS PURCHASED FROM VARIOUS METER MANUFACTURERS (YES / NO)	BOOLEAN
25.	COVER MADE OVERLAPPING TYPE HAVING COLLARS ON ALL FOUR SIDES (YES / NO)	BOOLEAN

26.	HINGES / STRIP HINGES ARE PROVIDED FROM INSIDE (YES / NO)	BOOLEAN
27.	HINGES ARE MADE OF 14 SWG M.S. SHEET & ARE 40 MM IN LENGTH FOR LOWER PARTITION & 60 MM IN LENGTH FOR UPPER PARTITION (YES / NO)	BOOLEAN
28.	COVER PROVIDED WITH SEMI CIRCULAR / CIRCULAR GOOD QUALITY NEOPRENE RUBBER GASKET OF 4 MM THICKNESS TO COMPLETELY FIT TO BASE (YES / NO)	BOOLEAN
29.	SEVEN MOUNTING MS SCREWS, ONE FOR UPPER (M4 THREADS X LENGTH 12 MM) AND SIX SCREWS (M4 THREADS X 35 MM LENGTH WITH NUT) IN MOVING SLOTTED FLAT ARE PROVIDED (YES / NO)	
30.	METER BOX CONFIRMS TO IP-55 (YES / NO)	BOOLEAN
31.	RUBBER LINING FIXED WITH ADHESIVE (YES / NO)	BOOLEAN
32.	TWONUMBERS U-SHAPED LATCH ARRANGEMENT PROVIDED TO EACH COMPARTMENT (YES / NO)	BOOLEAN
33.	HOLE OF 2 MM DIAMETER PROVIDED ON U-SHAPED LATCH (YES / NO)	BOOLEAN
34.	ADDITIONAL HOLE OF 8 MM PROVIDED IN THE U- SHAPED LATCH FOR LOCKS (YES / NO)	BOOLEAN
36.	ALL HOLES ON U-SHAPED LATCH ALIGN WHEN LATCH IS IN CLOSED POSITION (YES / NO)	BOOLEAN
37.	TWO WINDOWS WITH TOUGHENED WITH STAINLESS STEEL FRAME FROM INSIDE (YES / NO)	BOOLEAN
38.	MSEDCL LOGO PROVIDED ON WINDOW GLASS (YES / NO)	BOOLEAN
39.	GLASS FITTED IN FRAME WITH A WRAP AROUND SINGLE PIECE RUBBER RING WITHOUT JOINT MADE FROM GOOD QUALITY NEOPRENE RUBBER (YES / NO)	BOOLEAN
40.	SIZESOF WINDOWAS PER SPECIFICATION(YES /NO)	BOOLEAN

41.	MOUNTING ARRANGEMENT OF METER, MODEM & ANTENNA IN METER BOX IS BY WAY OF ADJUSTABLE SLOTTED POLYMERIC BRACKETS / STRIPS AS PER SPECIFICATIONS (YES / NO)	BOOLEAN
42.	MOUNTING ARRANGEMENT RAISED FROM THE BASE OF BOX BODY BY 20 MM (YES / NO)	BOOLEAN
43.	SEVEN MOUNTING MS SCREWS, ONE FOR UPPER (M4 THREADS X LENGTH 12 MM) AND SIX SCREWS (M4 THREADS X 35 MM LENGTH WITH NUT) IN MOVING SLOTTED FLAT ARE PROVIDED (YES / NO)	BOOLEAN
44.	FOUR 40 MM WIDE & 3 MM THICK STRIPS OF L-SHAPE WELDED / FIXED ON THE BOX (YES / NO)	BOOLEAN
45.	2 NOS. HOLES WITH SUPERIOR QUALITY RUBBER CABLE GLANDS OF INTERNAL DIAMETERS 30 MM EACH ARE PROVIDED AT BOTH THE SIDE WALLS OF THE BOX (YES / NO)	BOOLEAN
46.	RUBBER GLANDS ARE FIXED WITH SUITABLE ADHESIVE SO THAT THE SAME DO NOT GET REMOVED (YES / NO)	BOOLEAN
47.	RUBBER GLANDS ARE MADE SUCH THAT INTERNAL DIAMETER OF GLANDS CAN BE CLOSED WITH RUBBER FILM OF APPROXIMATELY 3 MM THICKNESS (YES / NO)	BOOLEAN
48.	ALUMINIUM CONNECTORS ARE PROVIDED (YES /NO)	BOOLEAN
49.	BOTH CABLE CONNECTOR STRIPS HAVE HOLES AT ENDS TO CLAMP WITH CABLE BY SCREWS & NUTS (YES/ NO)	BOOLEAN
50.	4 CABLE CONNECTORS SETS WITH 4 MM^2 CABLES CRIMPED WITH SUITABLE LUGS AT BOTH ENDS COMPLETE WITH SCREWS & NUTS ARE PROVIDED (YES/NO)	BOOLEAN
51.	CABLE CONNECTORS ARE INSULATED FROM OUTER SIDES WITH EPOXY INSULATION OF 2 MM THICKNESS (YES / NO)	BOOLEAN
52.	HANDLES ARE PROVIDED TO DOORS TO OPEN & CLOSE THE DOORS (YES / NO)	BOOLEAN
53.	TWO ZINC PASSIVATED WITHOUT POWDER COATING EARTHING BOLTS OF SIZE M8X25 MM ARE FITTED WITH THE BOX FROM INSIDE WITH 2 PLAIN WASHERS, 1 SPRING WASHER & TWO NUTS	BOOLEAN

	(YES / NO)	
54	ALL THE SCREWS AND WASHERS ARE PROPERLY ZINC PLATED (YES / NO)	BOOLEAN
55	LIFE EXPECTED IS 5YEARS (YES / NO)	BOOLEAN
56	IN-HOUSE TESTING FACILITY AVAILABLE. (YES / NO)	BOOLEAN
57	DETAILED DIMENSIONAL DRAWING SHOWING CLEARLY THE DIMENSIONS AND MATERIAL FOR METER BOX AND ITS CONSTRUCTIONAL FEATURES IS FURNISHED WITH THE OFFER (YES / NO)	BOOLEAN
58	NAME PLATE AS PER SPECIFICATION (YES / NO)	BOOLEAN
59	METER BOX IS TYPE TESTED (YES / NO)	BOOLEAN
60	TYPE TEST REPORT NOS.	TEXT
61	WHETHER YOU AGREE TO SUPPLY METER BOXES AS PER TECHNICAL SPECIFICATIONS OF THE TENDER (YES / NO)	BOOLEAN
62	GTP CURRENT TRANSFORMER	
a.	MAKE AND TYPE OF CT	TEXT
b.	APPLICABLE STANDARDS	TEXT
c.	CT RATIO	TEXT
d.	ACCURACY CLASS	TEXT
e.	RATED BURDEN	TEXT
f.	INSTRUMENT SECURITY FACTOR	TEXT
g.	RATED SHORT TIME CURRENT	TEXT
h.	REATED DYNAMIC CURRENT	TEXT
i.	INSULATION CLASS	TEXT
j.	RATED CONTINUOUS MAXIMUM CURRENT	TEXT
k.	TYPE TEST REPORT NO.	TEXT



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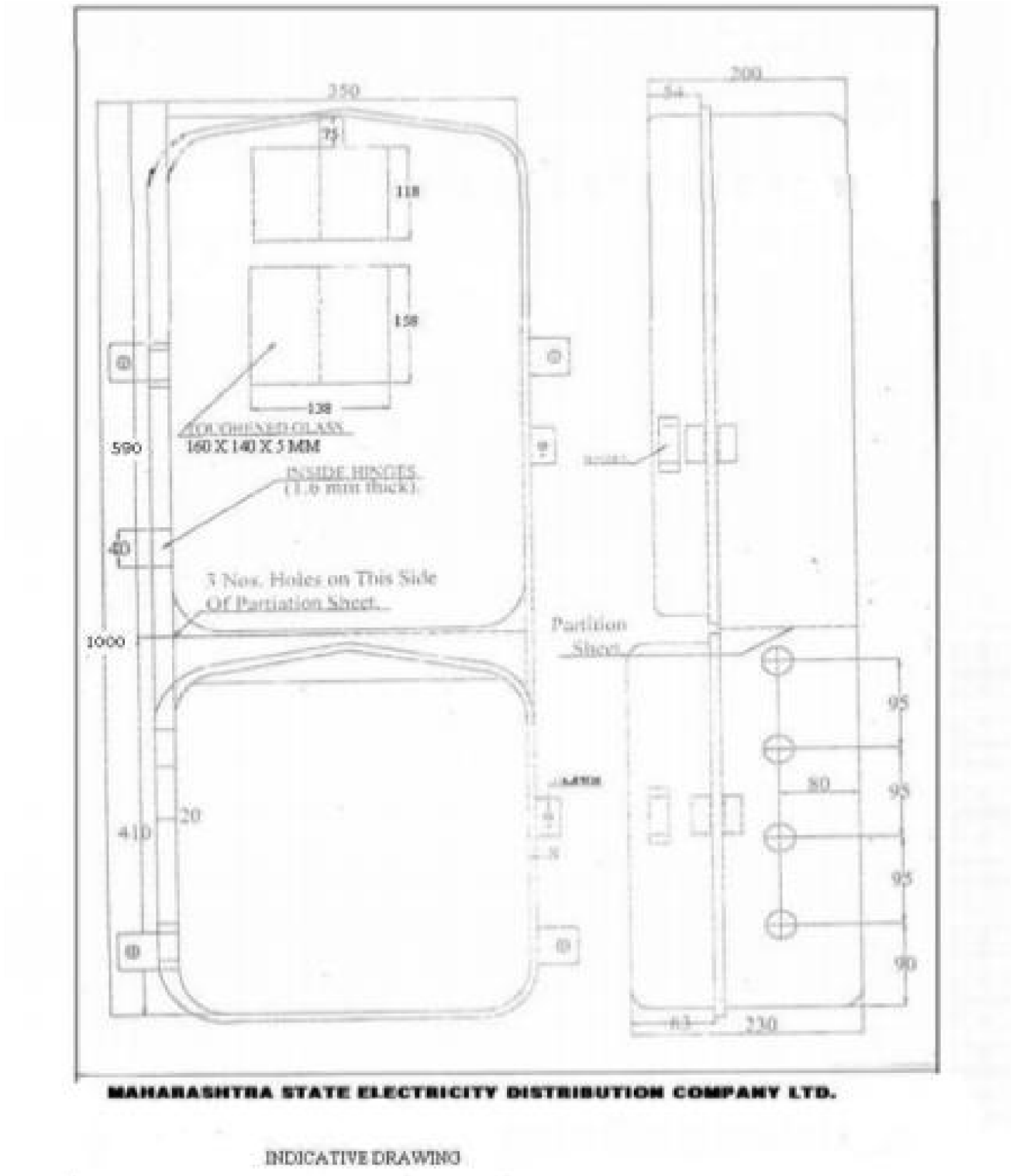
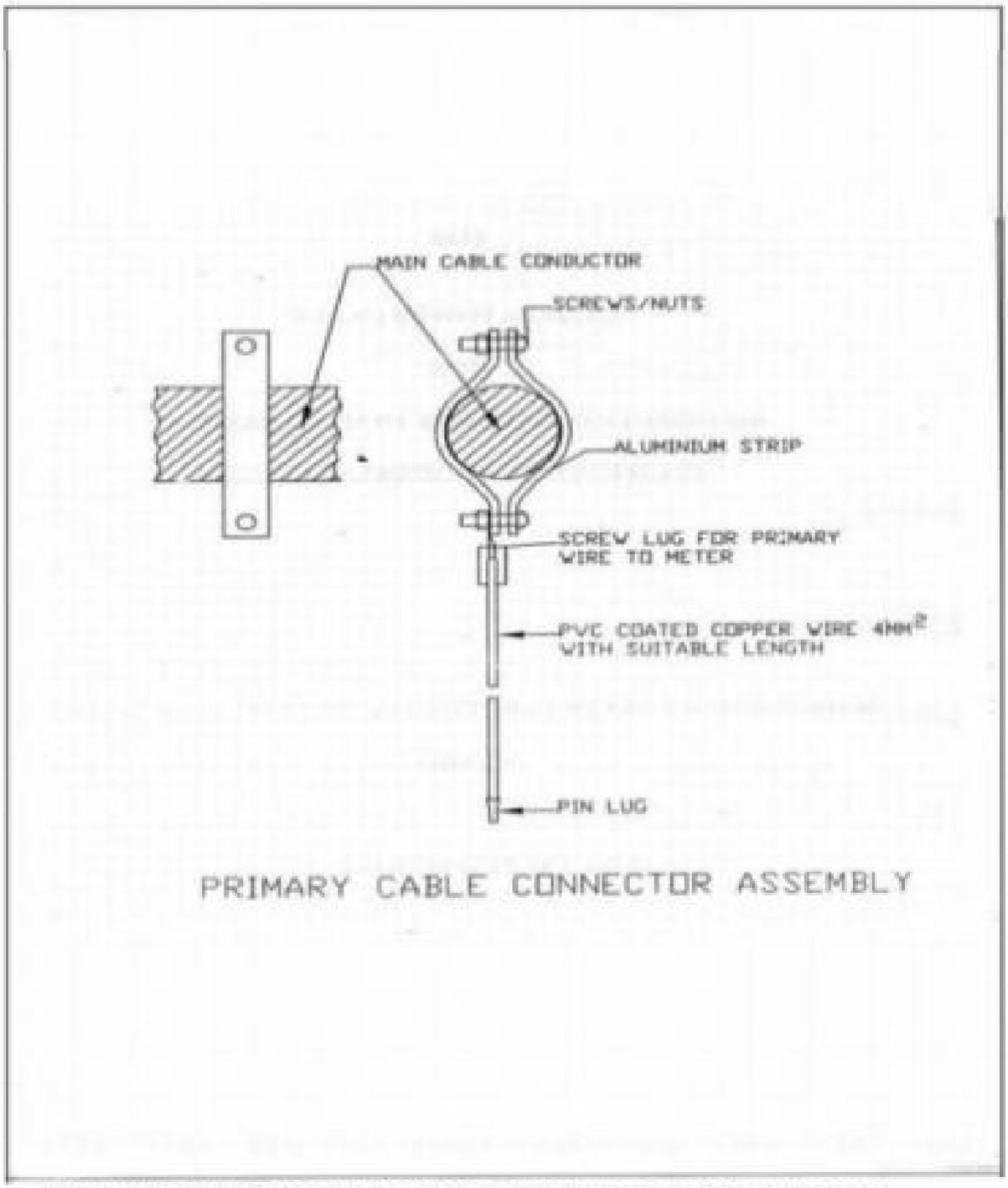
INDICATIVE DRAWING


250
75
118
158
138
FOR OPENED GLASS
160 X 140 X 5 MM
590
INSIDE HINGES
(1.6 mm thick)
40
3 Nos. Holes on This Side
Of Partiation Sheet.
1000
410
20
200
54
Partition
Sheet
95
80
95
95
90
63
230
MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.
INDICATIVE DRAWING


MAIN CABLE CONDUCTOR
SCREWS/NUTS
ALUMINIUM STRIP
SCREW LUG FOR PRIMARY WIRE TO METER
PVC COATED COPPER WIRE 4MM²
WITH SUITABLE LENGTH
PIN LUG
PRIMARY CABLE CONNECTOR ASSEMBLY
MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.
INDICATIVE DRAWING

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

LT AC THREE PHASE, FOUR WIRE, 40 - 200 AMPS ENERGY METER WITH IN-BUILT CT & MODEM (CT EMBEDDED METER) FOR CONSUMERS

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1.00 SCOPE

1.01 This specification covers the design, engineering, manufacture, assembly, inspection, testing at manufacturers Works before dispatch and supply of high precision LT AC Three Phase Four Wire **3 x 240 volt, 40 - 200 Amp** fully static and AMR compatible TOD Tri-Vector Energy Meter of accuracy class 1.0, capable of primarily performing functions of tariff meters and GPRS enabled modem and suitable accessories for automatic and remote data transfer from energy meter. The complete meter unit i.e. meter, internal CTs and modem shall be housed in the same enclosure. The meter shall have provision in such a way that supply / service cable of consumer shall be directly passed through the meter for current measurement. Piercing screws shall be used in the meter for voltage connection The meter shall be capable to record and display active energy, apparent energy, reactive energy (kVArh lag and kVArh lead separately) and maximum demand KW / KVA for Three Phase Four Wire AC balanced / unbalanced loads for a power factor range of Zero lag - unity – Zero lead-unity. Meters shall be supplied along with base-computer software (BCS) suitable to read the meter remotely as per the details given in this specification.

1.02 It is not the intent to specify completely herein all the details of the design and construction of material. However the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the right to reject any work or material which in his judgment is not in accordance therewith. The offered materials shall be complete with all components, accessories necessary for their effective and trouble free operation in the system for energy measurement. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

1.03 It is compulsory that the offered meter shall bear BIS certification i.e. the meters shall be ISI marked and the bidder shall have to furnish valid ISI licence along with the offer, which, if considered necessary, may be verified by the purchaser.

2.00 MINIMUM TESTING FACILITIES

2.01 Manufacturer shall posses fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS: 13779 / 1999 (amended up to date).

In addition, this facility shall produce Test Reports for each and every meter. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly. The list of testing equipments shall be enclosed.

2.02 The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests.

Sr. No.	**Name of Test**
(a)	A.C. Voltage test
(b)	Insulation Resistance Test
(c)	Test of Accuracy Requirement
(d)	Test on limits of errors
(e)	Test on meter constant
(f)	Test of starting condition
(g)	Test of no-load condition
(h)	Repeatability of error test
(i)	Test of power Consumption
(j)	Vibration test
(k)	Shock Test
(l)	Tamper conditions - as per MSEDCL specification
(m)	Glow Wire Test
(n)	Long duration test
(o)	Flammability Test
(p)	The manufacturer shall have duly calibrated RSS meter of class 0.1 accuracy

2.03 Meter Software

The Bidders will have to get appraised & obtain Capability Maturity Model Integration (CMMI)– Level III within one year from date of letter of award.

2.04 Notwithstanding anything stated herein under, the Purchaser reserves the right to assess the capacity and capability of the bidder to execute the work, shall the circumstances warrant such assessment in the overall interest of the Purchaser.

3.00 STANDARDS TO WHICH METERS SHALL COMPLY

Unless otherwise specified elsewhere in this specification, the performance and testing of the meters shall conform to the following Indian / International Standards and all related Indian / International standards to be read with upto-date and latest amendments / revisions thereof:

IS: 13779 / 1999 amended upto date and other relevant IS specifications including CBIP Tech report 325 amended upto date,

IEC 62053-21 Specification for AC static watt-hour meter for class 1 & 2

IS: 15959 / 2011 amended upto date for Data Exchange for Electricity Meter Reading, Tariff & Load Control – Companion Specification

CEA regulations and MERC guidelines with latest amendments.

IS: 15707 / 2006: Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice.

IS: 12063 Specification for degree of protection for enclosure.

IS: 11731 Specification for engineering plastic

The specification given in this document supersedes the relevant clauses of IS: 13779 / 1999 (amended up to date) wherever applicable.

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standard mentioned above, also shall be considered. For conflict related with the specification, the order of priority shall be – (i) this technical specification, (ii) IS: 13779 / 1999 amended upto date.

Bidder must posses the following certifications at the time of submission of the bid.

(a) ISO 9000.

(b) ISO 14000.

4.00 SERVICE CONDITIONS

As per IS: 13779 / 1999 (amended upto date), the meter to perform satisfactorily under Non - Air Conditioned environment (within stipulations of IS).

The meter to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

Environmental Conditions

a)	Maximum ambient temperature	55^0 C
b)	Maximum ambient temperature in shade	45^0 C
c)	Minimum temperature of air in shade	35^0 C
d)	Maximum daily average temperature	40^0 C
e)	Maximum yearly weighted average temperature	32^0 C
f)	Relative Humidity	10 to 95 %
g)	Maximum Annual rainfall	1450 mm
h)	Maximum wind pressure	150 kg/m^2
i)	Maximum altitude above mean sea level	1000 meter
j)	Isoceraunic level	50 days/year
k)	Seismic level (Horizontal acceleration)	0.3 g

l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

5.00 GENERAL TECHNICAL REQUIREMENTS

Meters are required for installation in the premises of LT consumers. The basic system parameters wherein these meters will be installed shall be as under:-

1.	Type of installation	Indoor/Outdoor
2.	TYPE	ISI marked LT AC, Three Phase, four wire, 40 - 200 Amps fully Static AMR compatible TOD Tri – vector Energy Meters with in-built CTs & Modem with RS-232 port for measurement of

		different electrical parameters including Active Energy (kWh), Reactive Energy (kVArh), Apparent Energy (kVAh) etc. in three phase, four wire balanced / unbalanced loads of LT Consumers
3.	ACCURACY CLASS	1.0 (FOR ACTIVE AND REACTIVE ENERGY)
4.	CURRENT RATING	40 – 200 Amps
5.	RATED BASIC CURRENT (Ib)	40 Amps per phase
6.	MAXIMUM CONTINUOUS CURRENT (Imax)	5 times (500 %) of Ib. The meter shall work accurately at 120% of Imax.
7.	STARTING CURRENT	0.2% of Ib.
8.	SHORT TIME CURRENT	As per IS 13779 / 1999.
9.	RATED VOLTAGE	3x240 Volts Phase to Neutral
10.	VOLTAGE RANGE	+ 20 % to – 40 % of rated voltage.
11.	TEMPERATURE	The standard reference temperature for performance shall be 27^{0}C. The mean temperature co-efficient shall not exceed 0.07%.
12.	FREQUENCY	50 Hz ±5%
13.	NO. OF PHASES	3 phase 4 wire
14.	SYSTEM EARTHING	Solidly grounded

15.	POWER FACTOR	Power Factor range: Zero Lag to unity to Zero Lead to unity Avg. P.F = $\frac{\text{Total(kWh)}}{\text{Total (kVAh)}}$ kVAh= $\sqrt{(\text{kWh})2 + (\text{RkVAhlag} + \text{RkVAhlead})2}$
16.	POWER CONSUMPTION	The active and apparent power consumption in each voltage circuit at reference voltage, reference temperature and reference frequency shall not exceed 2.0 W and 10 VA.
17.	AUXILIARY POWER	The meter shall draw power for working of electronic circuit from phase & neutral.
18.	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving parts; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.1 class) software based test bench.
19.	POWER SUPPLY	Switched-Mode Power Supply (SMPS)
20.	ISI MARK	The meter so supplied must bear ISI Mark.

6.00 CONSTRUCTIONAL REQUIREMENT / METER COVER & SEALING ARRANGEMENT

6.01 The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

(a) personal safety against electric shock:

(b) personal safety against effects of excessive temperature;

(c) protection against spread of fire;

(d) protection against penetration of solid objects, dust & water in meter.

6.02 Meters covered under this specification shall be fully static type with non-volatile memory to register various billing parameters and complete with other features as detailed out in this specification. Any other design meeting technical specification or features/accuracy etc., better than this specification and manufactured as per relevant IEC / IS / CBIP report shall also be acceptable.

6.03 Meter shall be installed in consumer premises out door or indoor, directly under the sun and extreme weather conditions. Suitability of such use shall be confirmed.

6.04 Meters shall be suitable for accurate measurement and display of energy and other billing parameters within the specified limits of errors under balanced and unbalanced load conditions in a poly phase network.

6.05 All insulating materials used in the construction of meters shall be non-hygroscopic, non-ageing and of tested quality.

6.06 All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results. The construction of the meter shall be such as to be sealed independently and prevent unauthorised tampering.

6.07 Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions.

6.08 The electrical connections shall be such as to prevent any opening of the circuit under normal conditions of use as specified in the standard.

6.09 The construction or the meter shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of the wiring, screws, etc. The meter shall not produce appreciable noise in use.

6.10 MATERIAL USED

6.10.1 The meter base & cover shall be made out of transparent / opaque unbreakable, high grade, fire resistant Polycarbonate material so as to

give it tough and non-breakable qualities. The meter case shall also have high impact strength.

6.10.2 The entire design and construction shall be capable of withstanding likely to occur in components is preferred for this purpose. Components used shall be of high quality and comply with International Industrial Standard practices.

6.11 Construction of the meter shall be such as to permit sealing of meter cover, piercing screw cover, etc. independently to ensure that the internal parts are not accessible for tampering without breaking the seals.

6.12 METER BODY

6.12.1 The poly carbonate body of the meter shall conform to IS: 11731 (FV-2 category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 1984 or IEC-60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2) 1986. The type test certificate shall be submitted along with the offer.

6.12.2 The meter shall be projection type and shall be dust and moisture proof. The meter cover shall be secured to base by means of sealable unidirectional captive screws. The provision shall be made on the Meter for at least two seals to be put by utility user.

6.12.3 The meter shall be compact and reliable in design e.g. to transport and immune to vibration and shocks involved in transportation/ handling.

The construction of the meter shall be suitable for its purpose in all respects and shall give assurance of stable and consistent performance under all conditions especially during dust storms / heavy rains / very hot days.

6.12.4 The meter shall conform to the degree of protection **IP 54 of IS: 12063 / IEC: 529** for protection against ingress of dust, moisture and vermin's. The type test certificate shall be submitted along with the offer.

6.12.5 The thickness of material for meter cover and base shall be 2 mm (minimum).

6.13 METER CASE AND FRONT DOOR

6.13.1 The meter shall have a case, which shall be sealed in such a way that the internal parts of the meter are not accessible unless body is broken. Minimum three sets of seals i.e. for Piercing screws, meter

cover and the front door shall be provided. The case shall be so constructed that any temporary deformation may not effect the satisfactory operation of the meter.

6.14 The meter unit shall have front-hinged door with suitable sealing arrangement (screws) and transparent window to view the display parameters. The front door shall be sealed independently over the terminal cover. Approach to the reading button and RS-232 port shall only be possible after opening the front cover or meter unit shall have one push button on outside of transparent meter cover which shall be accessible from font side of meter where communication port shall be provided on right side of the meter with proper sealing arrangement.

6.15 TERMINALS & TERMINAL BLOCK

6.15.1 The meter shall have provision in such a way that service cable of consumer shall be directly passed through the meter for measurement. Piercing screws shall be used in the meter for voltage connection.

6.15.2 The meter shall be suitable to accommodate aluminium cable of 200A current carrying capacity. Piercing screw shall have the quality and capability to puncture the cable of 200 A capacity.

6.15.3 The meter connection arrangement shall be such that so there is no need to remove insulation for connecting cable for current measurement. Design shall support thread through concept where connecting cable directly passed through the meter for measurement.

6.15.4 As the cable directly passed through the meter, the offered meter shall not have provision for meter terminal connection as well as terminal block.

6.15.5 The entire design and 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 vibrations during transportation and handling.

6.15.6 The voltage circuit and current circuit shall be solidly connected inside the meter body without any link.

A firm connection shall be established within the meter case to energise the voltage/current circuit. The connections shall be as per the recommended methods given in IS: 13779 / 1999 (amended upto date).

6.16 TERMINAL (PIERCING SCREW) COVER

6.16.1 The PT Piercing screw cover for the meter shall be extended type, which can be sealed independently & over the meter cover. The PT terminals shall not be accessible without removing the seals of the terminal cover when energy meter is mounted on the meter board/ wall.

6.16.2 Suitable Piercing teeth shall be provided for PT connection, connector shall have multiple teeth (minimum 5) such that in any case minimum 3 teeth shall pierce the insulation and the connection shall be firm.

6.17 INSULATION

The meter shall have durable and substantially continuous enclosure made of wholly insulating material, including the terminal cover, which envelops all metal parts with the exception of small parts and shall withstand an insulation test at 4 KV.

6.18 SEALING OF THE METER

6.18.1 Proper sealing arrangement shall be provided on the meter to make it tamper proof and avoid mishandling by any unauthorised person. It is necessary to provide unidirectional screws with single holes for sealing purpose.

6.18.2 The meter body shall be provided with minimum 2 nos. seals.

6.18.3 All the seals shall be provided on front side only.

6.18.4 Access to the working part shall not be possible without breaking the seals.

6.18.5 Provision of at least 2 nos. seals on front door, 1 no. seal on communication port, 2 nos. seals on the piercing screw terminal cover shall also be made. Rear side sealing arrangement is not acceptable.

6.18.6 The seals provided shall have proper locking arrangement to avoid opening of the seal in any case by means of tampering.

6.18.7 Beside body seals provided by the manufacturer, provision shall also be made to provide at least one utility lash wire seals on the body.

6.19 RESISTANCE TO HEAT AND FIRE

The piercing screw block, the piercing screw cover, the insulating material retaining the main contacts in position and the meter body shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them. The material of the piercing screw block shall not deflect under heating. To comply therewith, they must fulfill the tests as specified in

12.4 of IS: 13779 / 1999 amended upto date.

6.20 A push button shall be provided on the front side of the meter for high resolution reading of display with two decimal digits as brought out elsewhere in this specification (optional). Likewise, 2 push buttons shall be provided for scrolling the parameters in Alternate Display (On Demand) mode.

6.21 OUTPUT DEVICE

Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front. The test output device shall be provided in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes and accuracy test at the lowest load shall be completed with desired accuracy within 5 minutes. The pulse rate of output device (separate blinking LED must be provided for each parameter) which is Pulse / kWh and Pulse / kVArh (meter constant) shall be indelibly provided on the nameplate. It shall be possible to check the accuracy of active energy measurement of the meter on site by means of LED output.

6.22 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor

6.23 Power supply unit shall be micro control type instead of providing conventional transformer and then conversion to avoid magnetic influence.

6.24 REAL TIME INTERNAL CLOCK (RTC)

The real time quartz clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 Seconds per year. Facility for adjustment of real time shall be provided with proper security. The calendar and the clock shall be correctly set to Indian Standard Time.

The clock day / date setting and synchronization shall only be possible through password / Key code command from one of the

following:

a) Laptop or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger 'PC'.

The RTC battery & the battery for display in case of power failure shall be separate.

6.25 Non-specified display parameters in the meter shall be blocked and same shall not be accessible for reprogramming at site through any kind of communication

6.26 Complete metering system & measurement shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech-report 325 (amended up to date).

6.27 SELF DIAGNOSTIC FEATURES

(a) The meter shall keep log in its memory for unsatisfactory / non - functioning of Real Time Clock battery/ Low Battery indication on display and can be downloaded for reading through RS-232 port to read in base computer.

(b) The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.

(c) LCD Test display shall be provided for checking of all display Segments.

6.28 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal battery may be provided.

The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided. Alternatively, push button provided for displaying alternate mode (On Demand Mode) parameters shall also be acceptable for activation of battery during power OFF condition.

After activating the battery during power OFF condition, the meter shall display all Default Display (Auto Scrolling Mode) parameters only once, after which the battery shall switch OFF automatically. The battery shall be locked after 3 operations during one power OFF cycle.

As soon as the supply is resumed to meter, the battery shall automatically come to normal.

Billing Data downloading and Reading shall also be possible in power outage condition.

6.29 PCB used in meter shall be made by Surface Mounting Technology.

6.30 The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phase to neutral for 5 minutes.

6.31 The meter shall record and display total energy including Harmonic energy.

6.32 PERFORMANCE ON DC INJECTION

Apart from all the technical requirements as specified above, it shall also be ensured that meter shall not stop and record consumption accurately even on injection of DC voltage in neutral.

6.33 The accuracy of the meter and the measurement by meter shall not get influenced by injection of High frequency AC Voltage / chopped signal / DC signal and harmonics on the terminals of the meter. The meter accuracy shall not be affected by magnetic field from all sides of the meter i.e. front, sides, top and bottom of the meter.

6.34 The meter shall withstand any type of High Voltage and High Frequency surges, which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter.

The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 kV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(a) On any of the phases or neutral terminals

(b) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(c) At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device.

6.35 COMMUNICATION CAPABILITY

(a) The meter shall be provided with a hardware port compatible with RS 232 specifications (RJ - 11 / RJ - 45 type is also acceptable)

which shall be used for local data downloading through a DLMS compliant HHU, if any.

It shall be possible to download all data through RS-232 port provided on the meter. RS-232 port or TCP / IP port, as required, is also acceptable.

Sealing arrangement for RS-232 port shall be provided. The RS-232 port shall support the default and minimum baud rate of 9600 bps. Necessary chord for RS-232 Port of minimum length of 1 (One) metre in the ratio 50:1 shall be provided free of cost.

(b) **Remote communication mode for data retrieval**

Meter shall be provided with 4G intelligent modem embedded in meter body.

Modem should be compatible with data transmission over 2G, 4G/LTE. Modem should have facility for fall back to 2G networks, where 4G network is not available. Modem should support both Data and SMS transmission. It should have GPRS/EDGE features.

Modem should be capable of working on intelligent mode (Push mode) and transparent mode (Pull mode). Modem should have store and forward feature, while working in intelligent mode. By default, the modem should be working on intelligent mode. It should be possible to configure the modem for schedule to download data from meter (15 minutes/hourly/daily/weekly/monthly) through configuration tool and SMS. Modem should automatically download data from meter at configured intervals and this data should be stored in the modem. Also modem should automatically establish the connection with server configured and data stored in modem should be pushed to server at configured intervals.

It should be possible to convert mode of working of modem from intelligent mode (Push mode) to transparent mode (Pull mode) and vice-versa. Such conversion should be done through locally and remotely, over the air through configuration tool or through SMS. While working on transparent mode, modem should act as a completely transparent channel i.e. the Commands received from Centralized Head End System/MDAS should be conveyed to meter and data from meter should be conveyed to Centralized Head End System/MDAS without any changes in the mode.

Modem shall be connected such that the RS-232 port of meter shall be free for the data downloading.

On insertion of SIM card, modem should configure APN settings automatically based on SIM card inserted. APN details of network

service providers will be shared with successful bidders.

Configuration of modem using modem configuration utility:

It should be possible to read and write various modem configuration parameters such as baud rate, parity, data bits, APN details, Master SIM numbers etc. locally using PC/Laptop & over the air, remotely using this configuration utility. Also it should be possible to update the modem firmware locally and remotely using modem configuration utility.

Bidder should submit the configuration utility along with offer.

Configuration over the air:

Modem configuration parameters such as baud rate, parity, data bit, flow control, APN details with user name and Password, Network signal strength (CSQ),Server IP, Modem listening port, IP address of SIM, Master SIM numbers configured should be read by sending SMS to modem from any mobile phone. The SMS sent by modem should be readable in mobile phones with various operating systems e.g. Android, i-OS, Windows etc.

Modem can be configured for various parameters such as baud rate, parity, data bit, flow control, APN details with user name and Password, Server IP, Modem listening port, Master SIM numbers by sending SMS to modem from master SIM.

Modem should also support rebooting through SMS. SMS will be sent through master SIM only.

The bidder should share set of instructions required for over the air configuration through SMS.

Bidder has to provide software application to receive data sent by modems working on intelligent mode. It should be possible to generate XML file of meter data as per MIOS format, through this application. This application should be handed over to MSEDCL and the same should be deployed at MSEDCL. The demonstration of this application is to be done by bidder at the time of evaluation of sample meter.

6.36 RETENTION TIME OF THE NON-VOLATILE MEMORY

The meters shall make use of Non Volatile Memory capable of storing & retaining all the data required to be stored, without the help of any power source or battery back up.

The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does

not need any battery backup. The NVM shall have a minimum retention period of 10 years.

6.37 WIRE / CABLE LESS DESIGN

The meter shall be wireless to avoid improper soldering & loose connection / contact.

6.38 CALIBERATION, CONFIGURATION & PROGRAMMING

The Meter shall be only factory calibrated, configured and programmed. No device, such as potentiometers shall be used which can result in change of calibration at site. The above activities shall not be possible at site through the use of user software or any such means. It shall, however, be possible to check the accuracy in the field by means of the test output. No setting points / setting registers etc. shall be provided for adjustment of measurement errors. Once finalised, the meter constants shall be freezed and it shall not be possible by the manufacturer or the user to alter the meter constants either at factory or at site.

6.39 GPRS CONNECTIVITY SCOPE

6.39.1 MSEDCL will provide VPN based SIM cards under Network Bandwidth Service Provider (NBSP) umbrella contract. Presently, following service providers are participated under umbrella contract.

Vodafone, Airtel, Idea, Tata.

6.39.2 The cost of SIM card & recurring monthly charges shall be borne by MSEDCL. The bidder has to decide location wise service provider and inform the service provider wise SIM requirement to MSEDCL.

6.39.3 The bidder must provide at the time of commissioning all technical documentation and manuals for all the equipments so that if required, a third party is also able to maintain them.

6.39.4 Configuration of all meters / AMR devices installed in MSEDCL MDAS s/w for establishing the network using IP addresses so as to enable their monitoring through the system.

7.00 TOD TIMINGS

The meter shall be capable of registering the time-of-day energy and maximum demand.

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable.

At present the time zones shall be programmed as below.

Zone "A" : 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs

Zone "B" : 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs

Zone "C" : 09=00 Hrs. to 12=00 Hrs

Zone "D" : 18=00 Hrs. to 22=00 Hrs.

8.00 MAXIMUM DEMAND INTEGRATION PERIOD

The maximum demand integration period shall be set at 30 minutes with block window method.

9.00 MD RESET

It shall be possible to reset MD by the following options:

a) Communication driven reset through hand held terminal (HHU).

b) Automatic reset at the end of certain predefined period (say, end of the month) or auto reset MD at 24:00 hrs at the end of each billing cycle.

The auto reset option shall be programmable for any date and time as per requirement.

No push button shall be provided for MD reset.

10.00 TAMPER AND FRAUD MONITORING FEATURES

10.01 ANTI TAMPER FEATURES

The meter shall detect and correctly register energy only in forward direction under following tamper conditions:

(i) Change of phase sequence: The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(ii) The three-phase meter shall continue to work even without neutral.

(iii) The three-phase meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(iv) Visual indication shall be provided to safeguard against wrong connections to the meter.

(v) If a consumer tries to steal power by disconnecting the voltage supply of one or two phases of the meter externally or by tampering so that no voltage or partial voltage (< 50% of Vref) is

available to voltage circuit of meter & current is flowing in that phase, the meter shall record energy at Vref, current available in these phases & UPF.

(vi) The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

(vii) Meter shall also be immune for tamper by application of remote loop induction device (jammer).

(viii) The meter shall not get affected by any remote device. When meter is subjected to approx. 35 KV abnormal high voltage / frequency burst and remote loop induction device (jammer), it shall not hang and in case if it hangs once, it shall remain hanged permanently.

The bidder shall furnish detailed explanation as to how the meter is able to detect / protect recording the above tamper and fraud features with sketches and phaser diagram. Additional features, if any, in the meter may also be clearly indicated.

10.02 TAMPER EVENTS

10.02.1 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS.

10.02.2 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh, power factor, event code, date & time etc. listed in Table 32 to 37 of IS: 15959 / 2011.

10.02.3 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter.

10.02.4 Tamper details shall be retrieved by authorized personnel through either of the following:

i) HHU.

ii) Remote access through suitable communication network.

10.02.5 Minimum 200 numbers of events (occurrences & restoration with date & time) shall be available in the meter memory. The recording of abnormal events shall be on FIFO basis. The unrestored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months).

10.02.6 All the information of data shall be made available in simple & easy to understand format.

10.02.7 The threshold values for various tampers are as below.

Sr. No.	**Description**	**Occurrence (With Occ. Time 5 min.)**	**Restoration (With Rest. Time 5 min.)**
1.	PT link Missing (Missing potential)	< 50% of Vref and current in that phase is > 1% Ib	> 50 % of Vref
2.	Over voltage in any phase	> 115 % of Vref	< 115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance	Vmax - Vmin > 10 % Vmax	Vmax - Vmin < 10 % Vmax
5.	Current Unbalance (Diff. of phase currents)	> 30 % Iref* for 15 min	< 30 % Iref* for 15 min
6.	Over Current in any Phase	> 120 % I_{max}	< 120 % I_{max}
7.	Influence of permanent magnet or AC / DC electromagnet / permanent magnet	Minimum 10 seconds	1 minute after removal
8.	Neutral Disturbance	--	--
9.	Power failure	Immediate	Immediate
10.	Very Low PF	--	--
11.	Current Bypass	Bypass current >50% of Iref	Bypass current <30% of Iref
* Higher of 3 phase currents shall be taken as reference for this			

purpose.

11.00 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for polyphase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc as per details given in the table below and IS: 15959 / 2011.

b) Block Load Profile Parameters such as kVAh / kWh / kVArh (lag / lead) / Maximum Demand (MD) in kW / kVA / power factor / phase and line voltages / currents etc. as per details given in the table below and IS: 15959 / 2011.

c) Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh, etc. as per details given in the table below and IS: 15959 / 2011.

In addition to above the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters (Table 30, 31 32, 33, 34, 35, 36, 37 & 39 respectively) of IS: 15959 / 2011.

Detail of category wise parameters requirement suitable for

LT consumer metering is given in following tables of IS: 15959 / 2011.

Category C2	Parameter group	Annexure Table No.
LT consumer Energy Meters	Instantaneous parameters	27
	Block Load Profile parameters	28
	Billing Profile Parameters	29
	Name Plate details	30
	Programmable Parameters	31
	Event Conditions	32 to 37

All logging parameters for each of the event condition for 3 Φ / 4W	Capture parameters for event (Event Log Profile)	39

12.00 DISPLAY OF MEASURED VALUES

12.01 DISPLAY INDICATORS

The supply indication & calibration (pulse indication) indication shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the meter.

12.02 The display shall be permanently backlit Liquid Crystal Display LCD with wide viewing angle for clear visibility of the display of the meter reading & shall be visible from the front of the meter. Large viewing area with large display icons is preferred.

12.03 LCD shall be suitable for temperature withstand of 70^0 C.

12.04 Adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

12.05 The display shall be electronic and when the meter is not energized, the electronic display need not be visible.

12.06 The display shall not be affected by electrical and magnetic disturbances.

12.07 Dot-Matrix type LCD display is not acceptable.

12.08 The meter shall make use of non-volatile memory capable of storing and retaining all the data required to be stored, without the help of any power source or battery back up and shall have a minimum retention time of 10 years under un-powered condition.

12.09 The accuracy of display parameters for all parameters shall be matching with the accuracy class of meter as per IS.

12.10 MINIMUM CHARACTER SIZE

(a) The meter shall have 7 digits parameter identifier,

(b) The height of the display characters for the principal parameters values shall not be less than 5 mm. The size of digit shall be minimum 10x5 mm.

12.11 The decimal units upto 2 digits shall not be displayed in auto scroll mode. However it shall be displayed in push button mode for high-resolution display for testing.

12.12 In case of multiple values presented by single display, it shall be possible to display the contents of all relevant memories. When

displaying the memory, the identification of each parameter applied shall be possible. The principle unit for measured values shall be the kilowatt-hour (kWh) for active energy, kVArh for reactive energy & kVAh for apparent energy.

12.13 The display of various parameters shall be scrolling one after another. The display shall have ON time of at least 10 seconds for each measured value.

12.14 The meter shall be pre-programmed for following details.

(a) MD Integration Period: 30 Minutes.

(b) The meter shall Auto reset kVAMD at 24.00 Hrs. of last day of the month and this value shall be stored in the memory along with the cumulative kWh, kVAh, kVArh (lag) & kVArh (lead) readings.

(c) No reset push button shall be provided.

(d) Average power factor with 2 decimal digits shall be displayed.

(e) The array of data to be retained inside the meter memory shall be for the last 60 days for a capture period of 30 minutes. The load survey data shall be first in first out basis (FIFO).

12.15 There shall be two display modes on the meter – (1) The Default Display (Auto scrolling mode) and (2) the Alternate Display Mode (On Demand Mode or Push Button Mode

12.16 The Default Display (Auto scrolling mode) shall switch to Alternate Display (On Demand Display Mode) after pressing the push button continuously for 5 seconds.

12.17 The meter display shall return to Default Display Mode if the “On Demand” Push Button is not operated for 15 sec.

12.18 Auto display cycling push button is required with persistence time of 10 Seconds.

12.19 MINIMUM DISPLAY CAPABILITY (MEASURING PARAMETERS)

The sequence of display of various instantaneous parameters in Default Display Mode (Auto Scroll Mode) & Alternate Display Mode (On Demand Mode) shall be as per table 27 & 29 (except 8 & 9) of Annex E of IS: 15959 / 2011 in the sequence as below.

Display other than specified below shall be blocked.

(A) DEFAULT DISPLAY MODE (AUTO SCROLL MODE)

The following parameters shall be available in Default Display Mode (Auto Scroll Mode). The scroll period for auto scroll shall be 10 secs.

Default Display Mode (Auto Scroll) (Scrolling Time 10 Secs.)	
1.	LCD Test
2.	Real Time Clock – Date & Time
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh - Lag
9.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
10.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
11.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
12.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)
13.	Cumulative Energy –kVArh - Lead
14.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
15.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
16.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
17.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)
18.	Cumulative Energy – kVAh
19.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
20.	Cumulative Energy – kVAh - TOD Zone B (TZ2)
21.	Cumulative Energy – kVAh - TOD Zone C (TZ3)

22.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
23.	Current MD – kVA with occurance date & time
24.	MD - kVA – TOD Zone A (TZ1) with occurance date & time
25.	MD - kVA – TOD Zone B (TZ2) with occurance date & time
26.	MD - kVA – TOD Zone C (TZ3) with occurance date & time
27.	MD - kVA – TOD Zone D (TZ4) with occurance date & time
28.	Number of MD – kVA reset
29.	Rising MD with elapsed time
30.	Three Phase Power Factor – PF
31.	Cumulative Tamper Count
32.	Meter Cover Opening – Occurance with date and time.

(B) ALTERNATE DISPLAY MODE (ON DEMAND DISPLAY MODE) THROUGH PUSH BUTTON

The following parameters shall be available in Alternate Display (On demand Display Mode).

The display of these parameters shall be continuously scrolling one after another through push button. Display parameters shall move forward if button pressed prior to the programmed time for display of each parameter.

Alternate Display (On – Demand Display) (Push Button mode) (Scrolling Time 6 Secs.)	
1.	Last date & time of MD - kVA reset
2.	Current – I_R
3.	Current – I_Y
4.	Current – I_B
5.	Voltage – V_R

6.	Voltage – V_Y
7.	Voltage – V_B
8.	Signed Power Factor – R Phase
9.	Signed Power Factor – Y Phase
10.	Signed Power Factor – B Phase
11.	Frequency
12.	High resolution kWh (for calibration)
13.	High resolution kVArh Lag(for calibration)
14.	High resolution kVArh Lead(for calibration)
15.	High resolution kVAh (for calibration)
16.	Running Demand kVA (for calibration)
17.	M1 MD - kVA – TOD Zone A (TZ1) with occurance date & time
18.	M1 MD - kVA – TOD Zone B (TZ2) with occurance date & time
19.	M1 MD - kVA – TOD Zone C (TZ3) with occurance date & time
20.	M1 MD - kVA – TOD Zone D (TZ4) with occurance date & time
21.	M2 MD - kVA – TOD Zone A (TZ1) with occurance date & time
22.	M2 MD - kVA – TOD Zone B (TZ2) with occurance date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurance date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurance date & time
25.	Last Tamper Event with date and time.

Note:

(1) Other kVA MD values shall be available in reset backup data for 12 months.

(2) The meter display shall return to Default Display Mode if the “On Demand Push Button” is not operated for 15 sec.

(3) The meter shall display the tamper meter cover open with date & time in

auto scroll mode along with other parameters

13.00 BILLING DATA, BILLING HISTORY, LOAD SURVEY & TAMPER DATA

13.01 BILLING DATA

The billing data shall be as per table 29 of Annex E of IS: 15959 / 2011 for category C2 and is summarized as below.

Sr. No.	Parameters
1.	Billing Date
2.	System Power Factor for Billing Period
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh – Lag
9.	Cumulative Energy – kVArh – Lead
10.	Cumulative Energy – kVAh
11.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
12.	Cumulative Energy – kVAh – TOD Zone B (TZ2)
13.	Cumulative Energy – kVAh – TOD Zone C (TZ3)
14.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
15.	MD – kVA with occurance date & time
16.	MD – kVA – TOD Zone A (TZ1) with occurance date & time
17.	MD – kVA – TOD Zone B (TZ2) with occurance date & time
18.	MD – kVA – TOD Zone C (TZ3) with occurance date & time

19.	MD – kVA – TOD Zone D (TZ4) with occurance date & time
20.	MD – kW occurance date & time
21.	MD – kW – TOD Zone A (TZ1) with occurance date & time
22.	MD – kW – TOD Zone B (TZ2) with occurance date & time
23.	MD – kW – TOD Zone C (TZ3) with occurance date & time
24.	MD – kW – TOD Zone D (TZ4) with occurance date & time

13.02 BILLING HISTORY

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 12 months.

13.03 LOAD SURVEY PARAMETERS

The array of data to be retained inside the meter memory shall be for the last 60 days for a capture period of 30 minutes. The capture period for load survey data should be configurable. 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.

(1)	Real Time Clock – Date and Time
(2)	Current - I_R
(3)	Current – I_Y
(4)	Current – I_B
(5)	Voltage – V_{RN}

(6)	Voltage – V_{YN}
(7)	Voltage – V_{BN}
(8)	Block Energy – kWh
(9)	Block Energy – kVArh – lag
(10)	Block Energy – kVArh – lead
(11)	Block Energy – kVAh

The above billing data, TOD register's data, load survey data, tamper information and instantaneous parameters data shall all be retrievable through RS-232 port through a common meter reading instrument and shall be transferred (downloaded) to a PC with Windows based software to get complete details in numerical and/or graphic form. The necessary base computer software (BCS) for this purpose shall be provided by the supplier with complete details.

14.00 DEMONSTRATION

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

15.00 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS: 13779 / 1999 (amended upto date) and CBIP Tech. Report 325. The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 13779 / 1999 (amended upto date). In case of conflict, the priority shall be as per clause no. 3.00 of this specification.

16.00 HAND HELD UNIT (HHU)- OPTIONAL

16.01 To enable local reading of meters data, a DLMS (Device Language Message Specification) compliant HHU shall be provided.

16.02 The HHU shall be as per specification given in Annex J of IS: 15959 / 2011.

16.03 It shall be compatible to the DLMS compliant energy meters that are to be procured / supplied on the basis of this specification.

16.04 The HHU shall be supplied by the meter manufacturer along with the meter free of cost in the ratio of one for each 250 Nos. meters supplied including user manual and a set of direct communication cords for data downloading to the Laptop or PC for each HHU.

16.05 There shall be a provision for auto power save on HHU, which shall force the instrument in the power saving mode in case of no-activity within 5 minutes. The data shall not be lost in the event the batteries are drained or removed from the HHU.

16.06 The HHU shall have a memory capacity of 512 MB SRAM (Static RAM) with battery backup & upgradeable and BIOS / OS on FLASH / EEPROM Memory of 256 KB (RAM-512 MB, FLASH-2GB, SD Card- 8GB with USB facility)

16.07 The manufacturer / supplier shall modify the compatibility of HHU with the meter and the base computer system due to any change in language or any other reasons at their own cost within guarantee period.

16.08 The HHU shall be type tested for (a) Tests of Mechanical requirement such as Free fall test, Shock Test, Vibration test, (b) Tests of Climatic influences such as Tests of Protection against Penetration of Dust and Water (IP 6X), Dry Heat test, Cold Test, Damp Heat Cyclic Test, (c) Tests for Electromagnetic Compatibility (EMC), (d) Test of Immunity to Electromagnetic HF Fields and (e) Radio Interference Measurement.

16.09 The equipments offered shall be fully type tested at approved laboratory by National Accreditation Board for Testing and Calibration Laboratories (NABL) as per relevant standards within last 5 years from the date of opening of tender & the type test reports shall be enclosed with the offer.

17.00 COMPUTER SOFTWARE

17.01 For efficient and speedy recovery of data downloaded through HHU on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier.

17.02 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall generate the reports in pdf or excel format.

17.03 The Base Computer Software shall be "Windows" based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as HHU by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS.

17.04 The total time taken for downloading Billing, Tamper and Load Survey Data for 60 days shall be less than or equal to 8 minutes.

17.05 Downloading time of only Billing data shall be less than or equal to 20 secs.

17.06 It shall be possible to upload the HHU data to any PC having HHU software. A consumer based data uploading facility is required so that HHU shall upload data only in that PC which has the concerned consumers` data. The consumer code + meter no. shall be the key for creating consumers` files or overwriting consumers` files in PC. The software system files and data files shall be stored in different directories.

17.07 The BCS software shall create one single file for the uploaded data, e.g. if HHU contains the meter readings of, say, 2,000 consumer meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading in XML file as per MIOS for individual meter reading.

17.08 Meter manufacturers should also need to submit Convert API (API3) as per MIOS universal standard along with Base Computer System free of cost. This API should capable of converting both data i.e. AMR data collected from Read API (API1) and MRI data collected from CMRI.

17.09 Also there shall be a provision to give filenames while creating the file.

17.10 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3.

17.11 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

17.12 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHU.

17.13 The software provided on laptop or PC shall be compatible to read the data from USB drive and for that purpose a sample cable (1 No.) shall be provided with USB termination.

USB being the de-facto standard, this is the requirement.

17.14 MSEDCL is procuring large quantity of meters. As such manufacturer

have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing & Control Cell / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

18.00 METERING PROTOCOL

As per Category C2 of IS: 15959 / 2011.

19.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS

The connection diagram of the meter shall be clearly shown on inside portion of terminal cover & shall be of permanent nature.

Meter terminals shall also be marked & this marking shall appear in the above diagram.

20.00 INSTALLATION CHECK

While installing the meter, it shall be possible to check the correctness of the connection to the meters and their polarity from the functioning of the meter with the help of HHU under load condition. The phase sequence and phased association of voltage and current can be checked with the help of HHU.

21.00 NAME PLATE AND MARKING OF METERS

Meter shall have a nameplate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards.

Meter Serial Number shall be Bar Coded along with numeric number. The manufacturer's meter constant shall be marked on the nameplate. The size of bar coded number shall not be less than 35x5 mm. Meter serial number & bar code on sticker will not be allowed. In addition to the requirement as per IS, following shall be marked on the nameplate.

(i) Purchase order No & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Period as per tender document

(v) ISI mark

(vi) Category of Meter: **Category C2 – IS: 15959 / 2011**. The

character height of the same shall be minimum 3 mm in capital letters.

22.00 MOUNTING ARRANGEMENT

Suitable wall mounting arrangement for the complete meter unit shall be provided such that the mounting bolts shall be operated/ opened or accessible only after operation of a set of seal.

Proper locking arrangement shall be provided to protect from unauthorised removal of meter from its mount.

23.00 TESTS

23.01 TYPE TESTS

The meter offered shall have successfully passed all type tests described in the IS: 13779 /1999 (amended up to date), external AC / DC magnetic influence tests as per CBIP Tech Report 325 with latest amendments.

The Type Test Reports shall clearly indicate the constructional features of the type-tested meter. The type test reports of the meter shall be same as the meter offered. Separate type Test Reports for each offered type of meter shall be submitted.

All the Type Tests shall be carried out from Laboratories which are accredited by the National Accreditation Board for Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, ERDA, ERTL, etc. to prove that the meter meets the requirements of specification.

Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

The Type Test Certificate as per IS: 13779 / 1999 shall be submitted along with the offer. The Type Test certificate carried out during last five years shall be valid.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix-C of Latest – standardization of AC static electrical energy meters – CBIP publication No. - 325/ NPL / CQAL/ ERTL / ERDA at the sole discretion of the Purchaser. The supplier has no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier. It shall be the responsibility of the supplier to arrange such tests and Purchaser shall be informed of the date and time of conduction of tests well in

advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

23.02 The meter shall pass all the acceptance and routine tests as laid down in IS: 13779 / 1999 (amended up to date) and also additional acceptance tests as prescribed in this specification. (3 to 8 meters from a lot more than 1,000 will be sealed randomly in the factory and will be tested for tamper events).

23.03 ADDITIONAL ACCEPTANCE TESTS

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 13779 / 1999 (amended up to date).

(a) **Other Acceptance Tests**

i. The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage / problems.

ii. Meter shall be tested for tamper conditions as stated in this specification.

iii. Glow wire testing for polycarbonate body.

iv. Power consumption tests shall be carried out.

v. The meter shall comply all the tests for external AC / DC magnetic field as per CBIP Tech Report 325 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping. After removal of magnet, meter shall be subjected to accuracy test as per IS: 13779 /1999 (amended up to date). No deviation in error is allowed in the class index as per IS: 13779 /1999 (amended up to date) & this specification.

vi. The meter shall withstand impulse voltage at 10 kV.

The test 23.03 (a) (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 23.03 (a) (v) & (vi) shall be carried out on one sample from first lot as per procedure laid down in IS 13779 / 1999

(amended up to date) and CBIP Tech Report 325 (with latest amendments) in NABL LAB. The test report shall be got approved from the Chief Engineer, MSEDCL, Testing & Quaity Control Cell, 5th Floor, Prakashgad, Bandra (East), Mumbai – 400 051 before commencement of supply.

Likewise the type test certificate for the meter protocol used in the meter as per Category C2 of IS: 15959 / 2011 shall be got approved from the Chief Engineer, MSEDCL, Testing & Quaity Control Cell, 5th Floor, Prakashgad, Bandra (East), Mumbai – 400 051 before commencement of supply.

(b) **Limits of error**

(i) Limits of variation in percentage error due to change in voltage shall not exceed the values given in the following table:

SN	Influence quantities	Value of current (Balanced, unless otherwise stated)	Power factor	Limits of variation in % error for class 1 meter
(a)	Voltage variation – 15% to +10%	Ib Ib	1 0.5 lag	0.7 1.0
(b)	Voltage variation – 40%, + 20% & + 10%	Ib Ib	1 0.5 lag	1.1 1.5

(ii) The meter shall be tested at (-) 15% and at (-) 40% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.

For other influence quantities like frequency variation, voltage unbalance etc. the limits of variation in percentage error will be as per IS: 13779 / 1999 (amended up to date).

24.00 GUARANTEED TECHNICAL PARTICULARS

The tenderer shall furnish the particulars giving specific required details of Meters in schedule 'A'.

The offers without the details in Schedule `A' shall stand rejected.

25.00 PRE DESPATCH INSPECTIONS

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL's representative / Engineer attending the above testing will carry out testing on suitable number of meter as per sampling procedure laid down in IS: 13779 / 1999 (amended up to date) and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch. The meter shall be sealed after inspection at works.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer, Inspection Wing.

26.00 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing)

For carrying out Random Sample Testing (RST), the sample meters shall be drawn from any one of the stores against inspected lot and same shall be tested at any of the Testing and Quality Assurance Units at Aurangabad, Bhandup, Kolhapur, Nagpur, Nashik and Pune. Sample meters shall be drawn as per Annex H (Recommended Sampling Plan) of IS: 13779 / 1999 (amended upto date). Sample meters shall be tested by MSEDCL Testing Engineer in presence of supplier's representative jointly for (i) Starting Current, (ii) Limits of error, (iii) Repeatability of error, (iv) No Load Test as per IS: 13779 / 1999 (amended upto date) & (v) tamper conditions as per technical specifications and (vi) Data downloading time as per specifications.

The 5 days advanced intimation shall be given to the supplier and if the supplier fails to attend the joint inspection on the date informed, the testing shall be carried out by our Testing Engineer in absence of supplier's representative.

If the meters failed in above Random Sample Testing, the lot shall be rejected

27.00 GUARANTEE

The meter, Modem etc. shall be guaranteed as per tender document.

28.00 PACKING

28.01 The meters shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

28.02 The following information shall be furnished with the consignment:

- Name of the consignee
- Details of consignment
- Destination
- Total weight of the consignment
- Sign showing upper / lower side of the crate
- Sign showing fragility of the material
- Handling and unpacking instructions
- Bill of Materials indicating contents of each package & spare material

29.00 QUALITY CONTROL

29.01 The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification.

The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

29.02 The meters supplied shall give service for a long period with out drifting from the original calibration & performance must be near to zero percent failure.

30.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING

30.01 Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through

Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block / stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

The manufacturer shall submit the list of plant and machinery along with the offer.

Meter shall be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process.

Further, the Bidder shall own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities.

The calibration of meter shall be done in-house.

30.02 MANUFACTURING ACTIVITIES

Quality shall be ensured at the following stages.

30.02.1 At PCB manufacturing stage, each Board shall be subjected to computerized bare board testing.

30.02.2 At insertion stage, all components shall under go computerized testing for conforming to design parameter and orientation.

30.02.3 Complete assembled and soldered PCB shall under go functional testing using Automatic Test Equipments (ATEs).

30.02.4 Prior to final testing and calibration, all meter shall be subjected to ageing test ('burn-in' test process) (i.e. Meter will be kept in ovens for 72 hours at 55 deg C temperature & at full load current.

After 72 hours meter shall work satisfactory) to eliminate infant mortality.

30.02.5 The bidders shall submit the list of all imported and indigenous components separately used in meter along with the offer.

30.02.6 Bought out items:

A detailed list of bought out items, which are used in the manufacturing of the meter, shall be furnished indicating the name of firms from whom these items are procured.

The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

30.02.7 List of Plant and Machinery used for production of energy meter:

SN	**List of Plant and Machinery used for Energy meter Production**	
1	Fully automatic testing Bench with ICT for testing link less meter	Routine Testing and Calibration of Meter
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meter
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meter Class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meter
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs

13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	Resistance network and HMC manufacturing
17	Laser Trimming Machines	Trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meter
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meter
30	Short term over Current testing setup	Type testing of Meter
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meter
33	Composite Environmental testing chambers	Type testing of Meter

31.00 QUALITY ASSURANCE PLAN

31.01 The tenderer shall invariably furnish QAP as specified in Annexure I along with his offer. The QAP shall be adopted by him in the process of manufacturing.

31.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP

32.00 COMPONENT SPECIFICATION

As per Annexure - II enclosed.

33.00 SCHEDULES

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule 'A' …. Guaranteed and technical particulars.

34.00 DOCUMENTATION

a. All drawings shall conform to International Standards Organisation (ISO "A" series of drawing sheet / India Standards Specifications IS: 656. All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in S.I. Units.

b. List of drawings and documents:

   The bidder shall furnish the following along with bid

   (i) Two sets of drawing clearly indicating the general arrangements, fitting details, electrical connections etc.

   (ii) Technical leaflets (user's manual) giving operating instructions.

   (iii) Three copies of dimensional drawings of the quoted item.

c. The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication works in connection with the equipment prior to the approval of the drawing shall be at the supplier's risk.

d. Approval of drawings by purchaser shall not absolve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirements of the latest revision of application standards, rules and codes of practices.

The equipment shall conform in all respect to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have the power to reject the materials which, in his judgement, is not fully in accordance therewith.

e. The successful Bidder shall, within 2 weeks of notification of award of contract, submit three sets of final versions of all the drawings as stipulated in the purchase order for purchaser's approval. The purchaser shall communicate his comments / approval on the drawings to the supplier within two weeks.

   The supplier shall, if necessary, modify the drawings and resubmit three copies of the modified drawings for approval. The supplier shall within two weeks, submit 10 prints and two good quality report copies of the approved drawings for purchaser's use.

f. Ten sets of operating manuals / technical leaflets shall be supplied to each consignee for the first instance of supply.

g. One set of routine test certificates shall accompany each dispatch consignment.

h. The acceptance test certificates in case of pre-dispatch inspection or routine test certificates in cases where inspection is waived shall be got approved by the purchaser.

35.00 GENERAL

a) Principle of operation of the meter, outlining the methods and stages of computation of various parameters starting from input voltage and current signals including the sampling rate, if applicable, shall be furnished by the bidder.

b) The bidder shall indicate the method adopted to transform the voltage and current to the desired low values with explanation on devices used such as CT / shunt, potential divider as to how they can be considered superior in maintaining ratio and phase angle for variation of influencing quantities during its service period.

c) The bidder shall furnish details of memory used in the meter.

ANNEXURE – I

QUALITY ASSURANCE PLAN

A) The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub - suppliers for the raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of Bidder's representative, copies of test certificates,

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories,

iii) List of manufacturing facilities available,

iv) Level of automation achieved and list of areas where manual processing exists,

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections,

vi) List of testing equipments available with the bidder for final testing of equipment specified and test plan limitation, if any, vis-à-vis, the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i) List of raw materials as well as bought out accessories and the names of sub - suppliers selected from those furnished along with offers.

ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.

iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following:

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice, then the work may proceed.

D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality

Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization.

- > The duties and responsibilities assigned to staff ensuring quality of work.
- > The system for purchasing taking delivery and verification of material.
- > The system for ensuring quality workmanship.
- > The system for retention of records.
- > The arrangement for contractor's internal auditing.
- > A list of administration and work procedures required to achieve and verify contractor's quality requirements.

  These procedures shall be made readily available to the project manager for inspection on request.

ii) Quality Plans:

- > An outline of the proposed work and programme sequence.
- > The structure of the contractor's organization for the contract.
- > The duties and responsibilities assigned to staff ensuring quality of work.
- > Hold and notification points.
- > Submission of engineering documents required by the specification.
- > The inspection of materials and components on receipt.
- > Reference to contractor's work procedures appropriate to each activity.
- > Inspection during fabrication / construction.
- > Final inspection and test.

ANNEXURE - II

COMPONENT SPECIFICATION

The make/grade and the range of the components should be from the following list makes or equivalent reputed makes

SN	Component Function	Requirement	Makes & Origin
1.	Current	The Meters shall be with	

	Transformers	the current transformers as measuring elements. The current transformer shall withstand for the clauses under 5 & 9 of IS: 13779 / 1999	
2.	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	**USA:** Teridian, Analog Devices, Cyrus Logic, Atmel, Philips, Dallas, ST, Motorola, Texas Instruments, Maxim, Freescale, National Semiconductor, Onsemiconductors. **Germany**: Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria**: AMS. **Holland:** Philips (N X P) **Taiwan**: Prolific
3.	Memory chips	Memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. Meter shall have nonvolatile memory (NVM). No other type of memory shall be used for data recording and	**USA:** Teridian, Atmel, Philips, ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron. **Japan**: Hitachi,

		programming. (The life of the NVM is highest). There shall be security isolation between metering circuit, communication circuit, and power circuit.	Renasas. **Germany**: Siemens
4.	Display modules	The display modules shall be well protected from the external UV radiations. The display visibility shall be sufficient to read the Meter mounted at a height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for viewing angle). The construction of the modules shall be such that the displayed quantity shall not disturb with the life of display (PIN Type). It shall be Tran-reflective HTN or STN type industrial grade with extended temperature range.	**Singapore**: Bonafied Technologies, Displaytech, E-smart **Korea:** Advantek, Jebon, Union Display Inc. **Hong Kong**: Genda **China:** Success, Truly, Tianma. **Japan:** Hitachi, Sony, L & G. **Malaysia:** Crystal Clear Technology.
5.	Communication Modules	Communication modules shall be compatible for the two ports (one for IR port for communication with meter reading instruments (HHU) & the other for the hardwired RS-232 port to communicate with various modems for AMR)	**USA:** Agilent, HP, Fairchild, National Semiconductors, Optonica. **Holland:** Philips. **Korea:** Phillips. **Japan:** Hitachi. **Taiwan:** Ligitek
6.	Power supply	The power supply shall be	SMPS Type

		with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections. It shall not also be affected by magnet	
7.	Electronic Components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** Atmel, National Semiconductors, BC Component, Philips, Texas Instruments, Analog Devices. ST, Onsemiconductors, Maxim, Muruta, Kemet, Freescale, AVX, Intersil, Raltron, Fox, Fairchild, Agilent, Abracon, Diode Inc., Honeywell, Sipex Power Integration, Roham. **Japan**: Hitachi, Oki, AVZ, Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung. **India:** RMC, VEPL, KELTRON, Incap, PEC, Cermet, Gujarat Polyavx,

			Prismatic, MFR Electronic Components Pvt. Ltd, CTR. **Korea:** Samsung **Japan:** Panasonic **Germany**: Kemet, Vishay, Epcos, Diotech, Infineon. **Taiwan**: Yageo
8.	Mechanical parts	The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
9.	Battery	Maintenance free battery (Ni-mh or Li-ion) of long life of 10 years. Only non-rechargeable battery shall be used for RTC as well as display in absence of Power since the life & Reliability of these are better than the rechargeable batteries.	**USA**: Varta, Tedirun, Sanyo or National, Maxell, Renata. **Japan**: Panasonic, Sony. **France**: Saft. **Korea**: Tekcell. **Germany**: Varta.
10	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standard.	**USA**: ST, Teridian, Philips, Dallas, Atmel, Motorola, Microchip. **Japan**: NEC, Oki, Epson, Mitubishi.

11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

ANNEXURE – III

MSEDCL DEFINED OBIS CODES FOR PARAMETERS NOT PRESENT IN IS 15959/2011

SR. NO.	PARAMETERS	OBIS Code						Interface Class No./ Attribute
		A	B	C	D	E	F	

1.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)	1	0	5	8	1	255	3/2
2.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)	1	0	5	8	2	255	3/2
3.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)	1	0	5	8	3	255	3/2
4.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)	1	0	5	8	4	255	3/2
5.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)	1	0	8	8	1	255	3/2
6.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)	1	0	8	8	2	255	3/2
7.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)	1	0	8	8	3	255	3/2
8.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)	1	0	8	8	4	255	3/2

SCHEDULE 'A'

GUARANTEED TECHNICAL PARAMETERS

ITEM: LT AC THREE PHASE FOUR WIRE 40 – 200 AMPS FULLY STATIC AMR COMPATIBLE TOD TRI – VECTOR ENERGY METER WITH IN – BUILT CT MODEM AND RS-232 PORT

SR. NO.	PARAMETERS	GTP VALUES
1.0	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TO BE FILLED BY MANUFACTURER
2.0	MAKE & TYPE	TO BE FILLED BY MANUFACTURER
3.0	APPLICABLE STANDARD	IS 13779, IS 15959, CBIP 325
4.0	METER BEARS ISI MARK	YES
5.0	ACCURACY CLASS 1.00	YES
6.0	CURRENT RATING	40 – 200 AMPS
7.0	RATED BASIC CURRENT (IB)	40 AMPS PER PHASE
8.0	STARTING CURRENT	0.2% OF IB.
9.0	SHORT TIME CURRENT	AS PER IS 13779 / 1999.
10.0	RATED VOLTAGE	3X240 VOLTS PHASE TO NEUTRAL
11.0	VOLTAGE RANGE	+ 20 % TO – 40 % OF RATED VOLTAGE.
12.0	SYSTEM EARTHING	SOLIDLY GROUNDED
13.0	POWER FACTOR	ZERO LAG TO UNITY TO ZERO

		LEAD TO UNITY
14.0	STANDARD REFERENCE TEMPERATURE FOR PERFORMANCE	27^0C
15.0	MEAN TEMPERATURE CO-EFFICIENT DOES NOT EXCEED	0.07%.
16.0	FREQUENCY RANGE	50 Hz ±5%
17.0	ACTIVE AND APPARENT POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT AT REFERENCE VOLTAGE, REFERENCE TEMPERATURE AND REFERENCE FREQUENCY	SHALL NOT EXCEED 2.0 W AND 10 VA
18.0	APPARENT POWER TAKEN BY EACH CURRENT CIRCUIT, AT BASIC CURRENT IB, REFERENCE FREQUENCY AND REFERENCE TEMPERATURE	SHALL NOT EXCEED 4 VA
19.0	METER DRAWS POWER FOR WORKING OF ELECTRONIC CIRCUIT FROM PHASE & NEUTRAL.	YES
20.0	KVA MD PROVIDED	YES
21.0	INTEGRATION PERIOD OF KVAMD	30 MINUTES WITH BLOCK METHOD
22.0	METER BASE & COVER IS MADE OUT OF TRANSPARENT / OPAQUE, UNBREAKABLE, HIGH GRADE, FIRE RESISTANT, HIGH IMPACT STRENGTH POLYCARBONATE MATERIAL.	YES
23.0	CONSTRUCTION OF THE METER IS SUCH AS TO PERMIT SEALING OF METER COVER, PIERCING SCREW COVER, ETC. INDEPENDENTLY TO ENSURE THAT INTERNAL PARTS ARE NOT ACCESSIBLE FOR TAMPERING WITHOUT BREAKING SEALS.	YES
24.0	POLYCARBONATE BODY OF METER CONFORMS TO	YES

	(a) IS: 11731 (FV-2 CATEGORY)	
25.0	(b) HEAT DEFLECTION TEST AS PER ISO 75,	YES
26.0	(c) GLOW WIRE TEST AS PER THE IS: 11000 (PART 2/SEC-1) 1984 OR IEC-60695-2-12,	YES
27.0	(d) BALL PRESSURE TEST AS PER IEC-60695-10-2	YES
28.0	(e) FLAMMABILITY TEST AS PER UL 94 OR AS PER IS: 11731 (PART-2) 1986.	YES
29.0	TYPE TEST CERTIFICATE OF ABOVE SUBMITTED ALONG WITH OFFER.	YES
30.0	TYPE TEST CERTIFICATE NO. & DATE OF ABOVE	TO BE FILLED BY MANUFACTURER
31.0	METER IS PROJECTION TYPE, DUST AND MOISTURE PROOF.	YES
32.0	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS.	YES
33.0	PROVISION IS MADE ON THE METER FOR AT LEAST TWO SEALS TO BE PUT BY UTILITY USER.	YES
34.0	METER CONFORMS TO IP 54 OF IS: 12063 / IEC: 529 FOR PROTECTION AGAINST INGRESS OF DUST, MOISTURE AND VERMIN'S.	YES
35.0	TYPE TEST CERTIFICATE OF IP 54 SUBMITTED ALONG WITH THE OFFER.	YES
36.0	TYPE TEST CERTIFICATE NO. AND DATE OF IP 54	TO BE FILLED BY MANUFACTURER
37.0	THICKNESS OF MATERIAL FOR METER COVER AND BASE IS MINIMUM 2 MM.	YES
38.0	METER HAS A CASE, WHICH CAN BE SEALED IN	YES

	SUCH A WAY THAT THE INTERNAL PARTS OF THE METER ARE NOT ACCESSIBLE UNLESS BODY IS BROKEN.	
39.0	MINIMUM THREE SETS OF SEALS, I.E. FOR PIERCING SCREWS, METER COVER AND THE FRONT DOOR ARE PROVIDED.	YES
40.0	ANY TEMPORARY DEFORMATION OF CASE DOES NOT EFFECT THE SATISFACTORY OPERATION OF THE METER.	YES
41.0	METER HAS FRONT-HINGED DOOR WITH SUITABLE SEALING ARRANGEMENT (SCREWS) AND TRANSPARENT WINDOW TO VIEW THE DISPLAY PARAMETERS.	YES
42.0	FRONT DOOR CAN BE SEALED INDEPENDENTLY OVER TERMINAL COVER.	YES
43.0	APPROACH TO READING BUTTON AND RS-232 PORT IS ONLY POSSIBLE AFTER OPENING THE FRONT COVER.	YES
44.0	METER HAS PROVISION TO PASS CONSUMER SERVICE CABLE DIRECTLY THROUGH METER FOR MEASUREMENT.	YES
45.0	PIERCING SCREWS ARE USED IN THE METER FOR VOLTAGE CONNECTION.	YES
46.0	METER IS SUITABLE TO ACCOMMODATE ALUMINIUM CABLE OF 200A CURRENT CARRYING CAPACITY.	YES
47.0	METER CONNECTION ARRANGEMENT IS SUCH THAT THERE IS NO NEED TO REMOVE INSULATION FOR CONNECTING CABLE FOR CURRENT MEASUREMENT	YES
48.0	METER DESIGN SUPPORTS THREAD THROUGH CONCEPT WHERE CONNECTING CABLE DIRECTLY PASSED THROUGH THE METER FOR MEASUREMENT.	YES

49.0	OFFERED METER DOES NOT HAVE PROVISION FOR METER TERMINAL CONNECTION AS WELL AS TERMINAL BLOCK.	YES
50.0	VOLTAGE CIRCUIT AND CURRENT CIRCUIT ARE SOLIDLY CONNECTED INSIDE THE METER BODY WITHOUT ANY LINK.	YES
51.0	A FIRM CONNECTION IS ESTABLISHED WITHIN METER CASE TO ENERGISE VOLTAGE / CURRENT CIRCUIT.	YES
52.0	PT PIERCING SCREW COVER FOR METER IS EXTENDED TYPE, WHICH CAN BE SEALED INDEPENDENTLY	YES
53.0	PT TERMINALS ARE NOT ACCESSIBLE WITHOUT REMOVING THE SEALS OF THE TERMINAL COVER WHEN ENERGY METER IS MOUNTED ON THE METER BOARD/ WALL.	YES
54.0	SUITABLE CONNECTOR WITH MULTIPLE PIERCING TEETH ARE PROVIDED FOR PT CONNECTION	YES
55.0	MINIMUM 3 TEETH PIERCE THE INSULATION OF THE CABLE	YES
56.0	METER HAS DURABLE AND SUBSTANTIALLY CONTINUOUS ENCLOSURE MADE OF WHOLLY INSULATING MATERIAL, INCLUDING THE TERMINAL COVER, WHICH ENVELOPS ALL METAL PARTS WITH THE EXCEPTION OF SMALL PARTS AND SHALL WITHSTAND AN INSULATION TEST AT 10 KV.	YES
57.0	SEALING ARRANGEMENT IS MADE WITH UNIDIRECTIONAL SCREWS WITH SINGLE HOLES	YES
58.0	SEALS ARE PROVIDED ON FRONT SIDE ONLY.	YES
59.0	ACCESS TO WORKING PART IS NOT POSSIBLE WITHOUT BREAKING THE SEALS.	YES

60.0	PROVISION OF AT LEAST 2 NOS. SEALS ON FRONT DOOR, 1 SEAL ON COMMUNICATION PORT, 2 SEALS ON PIERCING SCREW TERMINAL COVER IS MADE.	YES
61.0	MATERIAL OF PIERCING SCREW BLOCK DOES NOT DEFLECT UNDER HEATING AND FULFILL THE TESTS AS SPECIFIED IN 12.4 OF IS: 13779 / 1999 AMENDED UPTO DATE.	YES
62.0	PUSH BUTTON ARRANGEMENT PROVIDED AS PER SPECIFICATION	YES
63.0	OPERATION INDICATOR VISIBLE FROM THE FRONT & IN THE FORM OF BLINKING LED OR OTHER SIMILAR DEVICES LIKE BLINKING LCD IS PROVIDED.	YES
64.0	RESOLUTION OF TEST OUTPUT DEVICE IS SUFFICIENT TO ENABLE STARTING CURRENT TEST IN LESS THAN 10 MINUTES AND ACCURACY TEST AT LOWEST LOAD CAN BE COMPLETED WITH DESIRED ACCURACY WITHIN 5 MINUTES.	YES
65.0	PULSE RATE OF OUTPUT DEVICE WHICH PULSE / KWH AND PULSE / KVARH (METER CONSTANT) IS INDELIBLY PROVIDED ON NAMEPLATE.	YES
66.0	IT IS POSSIBLE TO CHECK THE ACCURACY OF ACTIVE ENERGY MEASUREMENT OF THE METER ON SITE BY MEANS OF LED OUTPUT OF OUTPUT DEVICE.	YES
67.0	METER ACCURACY IS NOT AFFECTED BY MAGNETIC FIELD (AC / DC / PERMANENT) ON ALL THE SIDES OF METER, I.E. FRONT, SIDES, TOP AND BOTTOM OF THE METER AS PER CBIP TECHNICAL REPORT 325	YES
68.0	THE METER ACCURACY SHALL NOT BE AFFECTED BY EXTERNAL AC / DC /	YES

	PERMANENT MAGNETIC FIELD AS PER CBIP TECHNICAL REPORT 325 WITH LATEST AMENDMENTS. IF THE METER GETS AFFECTED UNDER INFLUENCE OF ANY MAGNETIC FIELD (AC / DC / PERMANENT), THEN THE SAME SHALL BE RECORDED AS MAGNETIC TAMPER EVENT WITH DATE & TIME STAMPING AND THE METER SHALL RECORD ENERGY MAXIMUM VALUE CURRENT (IMAX) AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	
69.0	NON - RECHARGEABLE AND PRE-PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR CORRECTION, REAL TIME QUARTZ CLOCK IS USED IN THE METER FOR MAINTAINING TIME (IST) AND CALENDAR.	YES
70.0	MAXIMUM DRIFT OF RTC DOES NOT EXCEED +/- 300 SECONDS PER YEAR.	YES
71.0	CLOCK DAY / DATE SETTING AND SYNCHRONIZATION IS POSSIBLE ONLY THROUGH PASSWORD / KEY CODE COMMAND FROM METER TESTING WORK BENCH OR REMOTE SERVER	YES
72.0	RTC BATTERY & THE BATTERY FOR DISPLAY IN CASE OF POWER FAILURE ARE SEPARATE	YES
73.0	NON-SPECIFIED DISPLAY PARAMETERS IN THE METER ARE NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION	YES
74.0	COMPLETE METERING SYSTEM & MEASUREMENT IS NOT AFFECTED BY EXTERNAL ELECTROMAGNETIC INTERFERENCE	YES
75.0	METER KEEPS LOG IN ITS MEMORY FOR UNSATISFACTORY / NON -FUNCTIONING OF REAL TIME CLOCK BATTERY AND CAN BE DOWNLOADED FOR READING THROUGH RS-232	YES

	PORT TO READ IN BASE COMPUTER.	
76.0	METER HAS FACILITY TO READ DEFAULT DISPLAY PARAMETERS DURING POWER SUPPLY FAILURE.	YES
77.0	INTERNAL BATTERY PROVIDED	YES
78.0	DOWNLOADING OF BILLING DATA THROUGH HHU IS POSSIBLE IN POWER OUTAGE CONDITION.	YES
79.0	METER CAPABLE TO WITHSTAND PHASE-TO-PHASE VOLTAGE APPLIED BETWEEN PHASE TO NEUTRAL FOR 5 MINUTES	YES
80.0	METER RECORDS AND DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY	YES
81.0	METER DOES NOT STOP AND RECORDS CONSUMPTION ACCURATELY EVEN ON INJECTION OF DC VOLTAGE IN NEUTRAL	YES
82.0	35 KV SPARK DISCHARGE TEST CARRIED OUT	YES
83.0	WIRELESS PCB IS DESIGNED	YES
84.0	METER PROVIDED WITH A HARDWARE PORT COMPATIBLE WITH RS-232 SPECIFICATIONS FOR LOCAL DATA DOWNLOADING THROUGH A DLMS COMPLIANT HHU	YES
85.0	SEALING PROVISION IS MADE FOR RS-232 PORT	YES
86.0	BAUD RATE OF RS-232 PORT	9600 BPS
87.0	1 MTR LONG CABLE PROVIDED FOR DOWNLOADING DATA ON HHU OR LAPTOP FROM RS-232 PORT	YES
88.0	GSM (GPRS ENABLED) MODEM IS PROVIDED EMBEDDED IN THE METER BODY.	YES
89.0	MAKE OF CHIPSET USED FOR MODEM	TO BE FILLED BY

		MANUFACTURER
90.0	MODEM CAN BE CONNECTED SUCH THAT RS-232 PORT IS FREE FOR DATA DOWNLOADING THROUGH HHU.	YES
91.0	NON VOLATILE MEMORY OF MINIMUM RETENTION PERIOD OF 10 YEARS PROVIDED	YES
92.0	6 (SIX) TOD TIME ZONES ARE PROVIDED FOR ENERGY AND DEMAND	YES
93.0	METER IS CAPABLE OF REGISTERING THE TIME-OF-DAY ENERGY AND MAXIMUM DEMAND.	YES
94.0	THE MAXIMUM DEMAND INTEGRATION PERIOD SHALL BE SET AT 30 MINUTES.	YES
95.0	PROVISION OF MD RESET THROUGH HHU	YES
96.0	PROVISION OF MD RESET AT 24:00 HRS AT THE END OF EACH BILLING CYCLE OR AUTOMATIC RESET AT THE END OF CERTAIN PREDEFINED PERIOD (SAY, END OF THE MONTH). NO PUSH BUTTON SHALL BE PROVIDED FOR MD RESET.	YES
97.0	AUTO RESTTING OPTION OF MD IS PROGRAMMABLE FOR DAY / DATE AS PER REQUIREMENT	YES
98.0	ALL ANTI TAMPER FEATURES INCORPORATED IN THE METER AS PER SPECIFICATION	YES
99.0	METER DETECTS AND LOGS TAMPER EVENTS AS PER SPECIFICATION	YES
100.0	METER KEEPS RECORD OF MINIMUM 200 ABNORMAL EVENTS ON FIFO BASIS	YES
101.0	METER DISPLAYS SUPPLY INDICATION & CALIBRATION (PULSE INDICATION) PERMANENTLY BY LED / LCD	YES
102.0	PERMANENTLY BACKLIT LIQUID CRYSTAL	YES

	DISPLAY LCD WITH WIDE VIEWING ANGLE OF MINIMUM 45^{O}C TO 60^{O}C AND UP TO ONE-METER DISTANCE VISIBLE FROM THE FRONT OF THE METER IS PROVIDED.	
103.0	LCD IS DESIGNED SUITABLY TO WITHSTAND TEMPERATURE OF 80^{O}C (STORAGE) & 65^{O}C (OPERATION).	YES
104.0	DISPLAY DOES NOT GET AFFECTED BY ELECTRICAL AND MAGNETIC DISTURBANCES	YES
105.0	METER HAS 7 DIGITS PARAMETER IDENTIFIER	YES
106.0	HEIGHT OF DISPLAY CHARACTERS FOR PRINCIPAL PARAMETERS VALUES IS NOT LESS THAN 5 MM.	NOT LESS THAN 5 MM
107.0	SIZE OF DIGITS	TO BE FILLED BY MANUFACTURER
108.0	AUTO DISPLAY CYCLING PUSH BUTTON IS PROVIDED WITH PERSISTENCE TIME OF	10 SECONDS.
109.0	DEFAULT DISPLAY MODE SWITCHES TO ALTERNATE DISPLAY MODE AFTER PRESSING THE PUSH BUTTON CONTINUOUSLY FOR 5 SECONDS.	YES
110.0	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF THE “ON DEMAND” PUSH BUTTON IS NOT OPERATED FOR 15 SEC.	YES
111.0	METER IS CAPABLE OF MEASURING AND DISPLAYING THE ELECTRICAL QUANTITIES WITHIN SPECIFIED ACCURACY LIMITS FOR POLYPHASE BALANCED OR UNBALANCED LOADS AS PER CATEGORY C2 OF IS: 15959	YES
112.0	METER HAS SUFFICIENT NON-VOLATILE MEMORY FOR RECORDING HISTORY OF BILLING PARAMETERS (CUMULATIVE KWH and CUMULATIVE KVAH AT THE TIME OF RESET	YES

	AND KVAMD) FOR LAST 12 MONTHS.	
113.0	PROVISION FOR LOAD SURVEY DATA FOR LAST 60 DAYS FOR A CAPTURE PERIOD OF 30 MINUTES ON FIFO BASIS.	YES
114.0	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
115.0	(a) TESTS OF CLIMATIC INFLUENCES SUCH AS TESTS OF PROTECTION AGAINST PENETRATION OF DUST AND WATER (IP 6X), DRY HEAT TEST, COLD TEST, DAMP HEAT CYCLIC TEST	YES
116.0	(b) TESTS FOR ELECTROMAGNETIC COMPATIBILITY (EMC)	YES
117.0	(c) TEST OF IMMUNITY TO ELECTROMAGNETIC HF FIELDS	YES
118.0	(d) RADIO INTERFERENCE MEASUREMENT	YES
119.0	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY	YES
120.0	LICENSED COPIES OF BASE COMPUTER SOFTWARE ARE SUPPLIED FREE OF COST	YES
121.0	METER IS CAPABLE TO COMMUNICATE DIRECTLY WITH LAPTOP COMPUTER.	YES
122.0	BASE COMPUTER SOFTWARE IS SUITABLE FOR ALL TYPES OF DOT MATRIX & INKJET PRINTERS	YES
123.0	SOFTWARE PROVIDED ON LAPTOP / PC IS COMPATIBLE TO READ DATA FROM USB DRIVE	YES
124.0	CABLE WITH USB TERMINATION PROVIDED	YES
125.0	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 60 DAYS	LESS THAN OR EQUAL TO 8 MINUTES

126.0	DOWNLOADING TIME OF ONLY BILLING DATA	LESS THAN OR EQUAL TO 20 SECS
127.0	METERING PROTOCOL AS PER CATEGORY C2 OF IS: 15959 / 2011	YES
128.0	METER PROTOCOL REPORT NO. & DATE	TO BE FILLED BY THE MANUFACTURER
129.0	NAMEPLATE IS CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE	YES
130.0	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER	YES
131.0	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
132.0	MOUNTING ARRANGEMENT AS PER SPECIFICATION PROVIDED	YES
133.0	WHETHER METER IS TYPE TESTED	YES
134.0	TYPE TEST REPORT ENCLOSED WITH THE BID DOCUMENTS	YES
135.0	TYPE TEST REPORT NO. & DATE	TO BE FILLED BY THE MANUFACTURER
136.0	ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS: 13779 / 1999 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY	YES
137.0	METER, MODEM AND ETC. GUARANTEED AS	YES

	PER TENDER DOCUMENT	
138.0	GUARANTEE TO REPLACE METER FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES
139.0	SAMPLE METERS TO BE SUBMITTED AS PER TENDER DOCUMENT	YES
140.0	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	YES
141.0	MANUFACTURING ACTIVITIES AS PER SPECIFICATION	YES
142.0	AGEING TEST CARRIED OUT	YES
143.0	QUALITY ASSURANCE PLAN AS PER SPECIFICATION SUBMITTED ALONG WITH OFFER	YES
144.0	COMPONENT SPECIFICATION IS AS PER SPECIFICATION	YES
145.0	TWO SETS OF DRAWING CLEARLY INDICATING THE GENERAL ARRANGEMENTS, FITTING DETAILS, ELECTRICAL CONNECTIONS ETC. ARE SUBMITTED ALONG WITH THE OFFER.	YES
146.0	TECHNICAL LEAFLETS (USER'S MANUAL) GIVING OPERATING INSTRUCTIONS ARE SUBMITTED ALONG WITH THE OFFER	YES
147.0	THREE COPIES OF DIMENSIONAL DRAWINGS OF THE QUOTED ITEM ARE SUBMITTED ALONG WITH THE OFFER	YES
148.0	DETAILS OF MEMORY USED IN THE METER.	TO BE FILLED BY THE MANUFACTURER

149.0	FOLLOWING IN HOUSE TESTING FACILITIES ARE AVAILABLE A. INSULATION RESISTANCE MEASUREMENT	YES
150.0	B. NO LOAD CONDITION	YES
151.0	C. STARTING CURRENT TEST	YES
152.0	D. ACCURACY TEST REQUIREMENT	YES
153.0	E. POWER CONSUMPTION	YES
154.0	F. FULLY COMPUTERISED METER TEST BENCH SYSTEM FOR CARRYING OUT ROUTINE AND ACCEPTANCE TEST IS AVAILABLE	YES
155.0	G. MANUFACTURER HAS DULY CALIBRATED STANDARD METER OF 0.1 CLASS ACCURACY	YES
156.0	H. GLOW WIRE TESTING	YES
157.0	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	TO BE FILLED BY THE MANUFACTURER
158.0	FURNISH PHYSICAL WATER ABSORPTION VALUE	TO BE FILLED BY THE MANUFACTURER
159.0	FURNISH THERMAL HDDT VALUE	TO BE FILLED BY THE MANUFACTURER
160.0	FURNISH FLAMMABILITY VALUE	TO BE FILLED BY THE MANUFACTURER
161.0	FLAMMABILITY V2	TO BE FILLED BY THE MANUFACTURER
162.0	GLOW WIRE TEST AT 650° C	TO BE FILLED BY THE

		MANUFACTURER
163.0	TENSILE STRENGTH	TO BE FILLED BY THE MANUFACTURER
164.0	FLEXURE STRENGTH	TO BE FILLED BY THE MANUFACTURER
165.0	MODULUS OF ELASTICITY	TO BE FILLED BY THE MANUFACTURER
166.0	IZOD IMPACT STRENGTH NOTCHED 23° C	TO BE FILLED BY THE MANUFACTURER
167.0	GPRS CONNECTIVITY FROM METER TO MSEDCL EXISTING MDAS SYSTEM ENSURED.	YES
168.0	SNMP SUPPORT FOR MODEM	YES

MATERIAL SPECIFICATIONS CELL

TECHNICAL SPECIFICATION

OF

LT 300/5 AMPS OR 400/5 AMPS OR 600/5 AMPS OR 800/5 AMPS CT OPERATED METERING CABINET COMPRISING OF CTs, MCCBs WITH SMART ENERGY METER ALONG WITH IN BUILT COMMUNICATION MODULE AS PER IS 16444 PART 2 / 2017

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1.00 SCOPE:

This Specification covers design, manufacture, testing at works, supply and delivery of SMC cabinet (Sheet Moulding Compound-FRP material) comprising of 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps resin cast CTs and LT AC, Three Phase, Four Wire, 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps CT operated fully Static AMR compatible TOD Tri-Vector Energy Meter as per IS-16444-Part 2 / 2017 Category D3 of IS: 15959 / 2011 (amended up to date), Relevant IEC for measurement of different electrical parameters listed elsewhere in this document including Active Energy (kWh), Reactive Energy (kVArh) Lag and (kVArh) Lead separately, Apparent Energy (kVAh) etc. in three phase, four wire balanced / unbalanced loads of LT Consumers. The system shall be AC, three phase, four wire, 415 Volts, 50 Hz with effectively grounded neutral.

The equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to purchaser, who will interpret the meaning of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply irrespective of whether those are specifically brought out in these specifications and / or the commercial order or not.

2.00 APPLICATION:

For use on LT consumer installations having load above 200 Amps and up to 300 Amps/400 Amps/600 Amps/800 Amps.

3.00 SERVICE CONDITIONS:

The equipments to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

Environmental Conditions

a)	Maximum ambient temperature	55^0C
b)	Maximum ambient temperature in shade	45^0C
c)	Minimum temperature of air in shade	35^0C
d)	Maximum daily average temperature	40^0C
e)	Maximum yearly weighted average temperature	32^0C
f)	Relative Humidity	10 to 95 %
g)	Maximum Annual rainfall	1450 mm
h)	Maximum wind pressure	150 kg/m2

i) Maximum altitude above mean sea level 1000 meters

j) Isoceraunic level 50 days/year

k) Seismic level (Horizontal acceleration) 0.3 g

l) Climate: Moderately hot and humid tropical climate conducive to rust and fungus growth.

As per IS-16444-Part 2 / 2017 (amended up to date), the meter to perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS). Meter body shall conform to IP51 degree of protection.

The meter shall be suitably designed for satisfactory operation under the hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish, which provided suitable protection to them from any injurious effect of excessive humidity.

4.00 GENERAL TECHNICAL PARTICULARS:

These cabinets are to be supplied as complete units consisting of LT AC, three Phase, four Wire, 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps CT operated fully Static AMR compatible TOD Tri-Vector Energy Meters with Optical port & in built communication module as per IS 16444 part 2 / 2017 RS 232 Port as per Category D3 of IS: 15959 / 2011 along with Resin cast CTs with and MCCBs in SMC material of S3 grade moulded cabinet duly wired as shown in the general arrangement drawings. The supply shall be as per final approved drawings.

Tenderer shall submit Type Test Reports for offered Meter, Resin cast CTs with plug-in type arrangement, MCCB & CT operated metering unit of each rating, along with offer, failing which the offer shall be rejected.

5.00 TECHNICAL SPECIFICATIONS FOR ENCLOSURE (METERING CABINET):

5.01 There shall be three compartments. The Meter & CT shall be housed in one compartment, MCCB in second compartment and outgoing terminal in third compartment. Separate partition to isolate the three compartments from each other shall be provided.

5.02 The compartments shall be made by using SMC (FRP material) of 2.5 mm thick. Additional M.S. angle of minimum 20 x 20 x 2 mm or formed channel of 2 mm sheet steel for supporting the doors shall be provided.

5.03 The enclosure shall be moulded out of SMC (FRP material) of S3 grade confirming to IS: 13410 of not less than 2.5 mm thickness.

5.04 The enclosure shall comply with the requirement of IP 55 type as per IS

13947 or the latest version thereof with Meter, CTs, MCCB and other accessories enclosed.

5.05 Suitable vents fitted with G. I. Double wire mesh shall be provided from inside to ensure that the temperature inside the enclosure is not substantially different from that of the atmosphere.

5.06 Fixing of MCCB inside the enclosure shall be such as to allow free circulation of air at its back and sides.

5.07 Doors of the each chamber shall be provided with panel lock \ locks. Two master keys for opening the doors shall be provided. In addition to the panel lock, arrangement for providing pad locks shall be made. The hinges for compartment covers shall be as shown in the drawing and shall be so designed that the door cannot be opened without breaking the seals, i.e. the hinges shall be provided from inside.

5.08 Necessary fixing arrangement shall be provided at the back of the enclosure. The thickness of the fixing plate shall be minimum 5 mm.

5.09 Durable neoprene rubber gasket shall be provided around the enclosure to ensure dust and vermin proof door construction. Rubber lining shall be at least 3 mm thick.

5.10 Roof shall be slopping down backwards with 5 degree angle.

5.11 The knock out holes shall be provided on the bottom. Suitable size of brass Cable glands shall be provided for these holes. The size of cable shall be aluminium XLPE armoured cable as per suitable current rating of CT.

5.12 Sealing arrangement shall be provided for Meter, CT, MCCB & outgoing terminal chamber separately.

5.13 Inter connecting cable for connection from CT to MCCB & from MCCB to outgoing terminal block shall be single core multi-stranded copper cable of size 185 sq.mm for 300/400 Amps, 400 sq.mm for 600 Amps & 630 sq.mm for 800 Amps.

5.14 The Danger Board as per MSEDCL drawing and confirming to IS: 2551 / 1982 shall be fitted on the cabinets.

5.15 The lugs suitable for single core multi stranded copper cables of size 300 sq. mm shall be used for making connections inside the cabinet. All lugs shall be made out of tinned copper.

5.16 All holes for internal connections through which cables \ leads are supposed to pass shall be provided with rubber grommet.

5.17 Suitable Stainless Steel handles on both doors shall be provided to all the doors separately to open and close.

5.18 For SMC cabinet, the MCCB & CTs shall be mounted on SMC sheet of 6 mm thick or an angle frame and then it shall be fitted in enclosure. The

meter shall be mounted on the arrangement as shown in the drawing.

5.19 The dimensions of the outgoing terminal block of Bakelite shall be minimum 300 x 50 x 15 mm for 800 Amps cabinets. The tinned copper strip of 25 x 8 mm and 180 mm long size shall be provided for outgoing termination of cables. Incoming terminal of CT having 80 mm minimum length shall be bolted directly on the terminal block. Fully threaded Stainless Steel bolts with 2 nuts and washers of size shown in the drawing shall be provided for connections.

5.20 MCCB shall be so mounted that its operating knob / lever can be operated from outside without opening the door. It shall also be possible to lock the MCCB in "OFF" position so that it cannot be switched "ON".

5.21 Toughened glass of 200 x 150 x 2 mm size for observing meter reading shall be provided from inside the door. It shall be so fitted that in the event of breaking, it shall be possible to replace it after opening the door.

5.22 All the wiring inside the cabinet is included in the scope of work. The internal copper cables shall be suitably clamped inside the cabinet.

5.23 CTs shall be fixed with proper clamps using stainless steel bolts. All nuts & bolts used in the cabinet for current carrying path shall be of Stainless Steel only.

5.24 The Colour of the SMC Meter box shall be Siemens Grey.

5.25 The SMC meter box shall be made of anti-corrosive, dust proof, rust proof, vermin and water proof, ultra violet stabilized and flame retardant high grade SMC material having good dielectric and mechanical strength property

5.26 SAFETY ARRANGEMENTS:

5.26.01 Two galvanized M.S. earthing bolts of M10X35 size shall be provided for external earth connections. These shall be complete with plain washers, spring washers, nuts, etc. Earthing Bolts must be fitted properly to prevent removal of the same from the box.

5.26.02 All live connections shall be insulted with durable insulation material

5.27 TESTING AND MANUFACTURING FACILITIES

5.27.01 TESTING FACILITIES:

The Tenderer must clearly indicate the details of testing facilities available in the works of manufacturer and whether the facilities are adequate to carry out all the Routine and Acceptance tests. These facilities shall be available to MSEDCL Engineers, if deputed to carry out or witness the tests in the manufacturer's works. The tenderer must have all in-house testing facility to carry out acceptance & routine tests on the Cabinet. If any test cannot be carried out in the manufacturer works, the same shall be clearly stated. All testing equipments shall be

duly calibrated in the NABL approved laboratories.

In case of SMC enclosure, the tenderer shall have in house testing facilities to carry out all the Routine and Acceptance tests as per IS 13410 / 1992

5.27.02 The tenderer shall have following minimum manufacturing facilities in-house to prove his reliability as a manufacturer of CT Operated Energy Metering Cabinet.

For SMC enclosure, the tenderer shall have the following minimum manufacturing facilities in house to prove his reliability as a manufacturer of CT Operated Energy Metering Cabinet.

(a) SMC material manufacturing machine

(b) Hydraulic press for hot press compression moulding

(c) Assembly lines for fabrication and fitting

(d) Assembling tools

The tenderer shall furnish detailed process of painting. In case the painting is to be carried out from outside agency, the tenderer shall furnish the facilities available with sub-contractor.

6.00 TESTS & TEST CERTIFICATES

6.01 The LT CT Operated Metering Cabinet consisting of Meter, MCCB, CTs, etc. as per the specifications shall be fully type tested in accordance with the relevant standards and as per the MSEDCL requirement at NABL accredited lab. The tenderer shall furnish detailed type test reports of the tests carried out within 5 years prior to due date of opening of offer.

All the type test reports shall be submitted along with offer and got approved from the Chief Engineer, Testing & Quality Control Cell, MSEDCL, 5th Floor, Prakashgad, Bandra (E), Mumbai – 400 051 as per the tender conditions.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost.

All the Type Tests specified in the technical specifications shall be carried out from laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Government of India such as ERDA, ERTL, CPRI, etc. to prove that equipments meet the requirement of the specification. The tenderer shall also furnish certificate from laboratories where type tested that required test facility available in house for that particular test. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable

6.02 The type test reports for CT Operated Metering Cabinet as given below shall be furnished with certified drawings to prove that equipment offered

meets the following requirement of the specification.

Type Tests for SMC Meter Box:

Sr. No.	Test	Reference Standard	Required Value
1	Ratings	IS-14772:2020, Cl. 6	As per IS and specification
2	Classification	IS-14772:2020, Cl. 7	As per IS
3	Marking	IS-14772:2020, Cl. 8	Manufacturer Name & Danger Logo Screen Printing
4	Dimensions	IS-14772:2020, Cl. 9	As per specification and drawing
5	Protection against Electric Shock	IS-14772:2020, Cl. 10	As per IS
6	Provision for Earthing	IS-14772:2020, Cl. 11	As per IS
7	Construction	IS-14772:2020, Cl. 12	No Crack or Damage
8	Resistance to ageing, protection against ingress of solid objects and against harmfull ingress of water	IS-14772:2020, Cl. 13	No Crack or Damage
9	Insulation resistance and electric strength	IS-14772:2020, Cl. 14	Insulation resistance shall be not less than 5 MΩ. No flashover or breakdown shall occur during the electrical strength test
10	Mechanical Strength	IS-14772:2020, Cl. 15	No Crack or Damage
11	Resistance to Heat	IS-14772:2020, Cl. 16	No ball impression
12	Creepage distance, clearance and distance through seating compound	IS-14772:2020, Cl. 17	As per IS
13	Resistance to insulating material to abnormal heat and fire	IS-14772:2020, Cl. 17	No Flame and Glowing
14	Resistance to Tracking	IS-14772:2020, Cl. 19	No failure or breakdown occurs before 50 Drops 175V
15	Resistance to corrosion	IS 14772:2020, Cl. 20	No sign of rust observed
16	Heat Deflection Temperature	IS 13411:1992	> 150 deg C
17	Exposure to Flame	IS 4249:1967	Self Extinguishing
18	Flammability	UL-94/IS-11731	V0

19	Melting Point	IS:13360 (Part-6/Sec-10):1992	Does not melt upto 400 deg C
20	Glow wire test at 960 Deg C	IS:11000	No flame and glowing observed
21	Ball Pressure Test	IEC-335	No Ball Impression Observed
22	UV Ageing Test for 200 Hours	ASTM-G-154	No Colour Change, no chalking and No discoloration observed
23	Water Absorption	IS:13411-1992	< 0.20%
24	Material Identification	As per Laboratory Method	Glass reinforced polyester Sheet Moulding compound (SMC)
25	Glass content, percent by mass (Min.)	IS:13410-1992	20
26	Izod impact strength (Notched), KJ/m2	IS:13410-1992	55
27	Flexural Strength ,MPa , Min	IS:13410-1992	170
28	Power Arc Resistance Sec. Min.	IS:13410-1992	180
29	Modulus of Elasticity, 10^3 , MPa	IS:13410-1992	12 to 15
30	Tracking Resistance CTI, Min	IS:13410-1992	1000
31	Tensile strength, MPa, Min	IS:13410-1992	70
32	Density of moulding, g/ml	IS:13410-1992	1.8 to 2.1
33	Volume resistivity, ohmcm, min	IS:13410-1992	1×10^{14}
34	Surface resistivity (24H in water), Ohm, min	IS:13410-1992	1×10^{13}
35	Flow, mm, Min	IS:13411-1992	As per IS
36	Mould shrinkage, linear percent, Max	IS:13411-1992	As per IS
37	Post shrinkage, Max	IS:13411-1992	As per IS
38	Dielectric Strength at 90oC in Oil KV/mm	IS:13410-1992	11
39	Dissipation factor (4 days at 80 % RH & 1 KHz)	IS:13410-1992	0.01
40	Oxygen Index,% Min	IS:13410-1992	24

6.03 Acceptance Tests:

Following tests shall be carried out as acceptance tests in addition to Routine Tests.

On Complete Unit

Temperature Rise Test on one sample of each rating. Temperature rise test will be carried out as per the procedure given below:

For temperature rise test, a metering cabinet with all assembly of MCCBs, CT, and meter shall be kept in an enclosure such that the temperature outside the box shall be maintained at 50^0 C.

Time current characteristic for MCCB at 1.05 & 1.2 times overload release setting current.

On CT as per relevant IS: 16227

On MCCB as per relevant IS: 13947 / 1993.

Tests as per IS: 8623 / 1993 on the Enclosure.

Tests as per IS: 13410 for SMC Enclosure

6.04 Routine tests:

(a) On Complete Unit

(i) Overall Dimension checking.

(ii) Insulation Resistance Tests.

(iii)High Voltage Test.

(b) Operation Test on MCCB.

(c) On CT as per relevant IS: 16227.

(d) On MCCB as per relevant IS: 13947 / 1993.

(e) Tests as per IS: 13410 / 1992 for SMC Enclosure

For MCCB, CT & Meter, required tests shall be carried out at Original Equipment Manufacturer's work

7.00 <u>TECHNICAL SPECIFICATIONS OF LT AC THREE PHASE FOUR WIRE CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI- VECTOR ENERGY METER AS PER IS 16444 PART 2/2017 CATEGORY "D3" OF IS 15959/2011 (AMENDED UPTO DATE)</u>

7.01 SCOPE:

This specification covers design, manufacturing, testing, supply and delivery of ISI marked LT AC, three Phase, four Wire, 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps CT operated fully Static and AMR compatible TOD Tri - Vector Energy Meters with Optical & in built communication modem as per IS 16444 part 2 / 2017 as per Category D3 of IS: 15959 / for measurement of different electrical parameters listed elsewhere in the document including Active Energy (kWh), Reactive Energy (kVArh) Lag and (kVArh) Lead separately, Apparent Energy (kVAh) etc. in three phase, four wire balanced /

unbalanced loads of LT Consumers.

7.02 GENERAL TECHNICAL REQUIREMENT:

1	TYPE	LT AC, Three Phase, Four Wire, 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps CT operated fully Static & AMR compatible TOD Tri - Vector energy Meters with Optical & in built communication modem as per IS 16444 part 2 / 2017 as per Category D3 of IS: 15959 / 2011 for use on LT Consumers installation..
2	FREQUENCY	50 Hz ± 5%
3	ACCURACY CLASS	0.5S (FOR ACTIVE AND REACTIVE ENERGY)
4	RATED VOLTAGE	415 V Ph-Ph or 240 V Ph-N
5	VOLTAGE RANGE.	+10% to -20% of rated voltage.
6	CURRENT RATING	300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps
7	BASIC CURRENT Ib	5 Amps
8	MAXIMUM CONTINUOUS CURRENT (Imax)	2 times (200 %) Ib
9	SHORT TIME OVER CURRENT	As per IS: 16444:Part 2 :2017
10	STARTING CURRENT	0.1% of Ib
11	POWER CONSUMPTION	The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 5.0 W and 15 VA during the idle mode of communication module. The additional power requirement during data transmission shall not exceed 7 W per communication module. The apparent power taken by each current circuit, at basic current Ib, reference frequency and reference temperature shall not exceed 1 VA.
		Power Factor range: Zero Lag to unity to Zero Lead

12	POWER FACTOR	Avg. P.F = Total(kWh) / Total (kVAh) $kVAh=\sqrt{(kWh)^2+(RkVAhlag+RkVAhlead)^2}$
13	DESIGN	Meter shall be designed with application specific integrated circuit (ASIC) or micro controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.1 class) software based test bench.
14	POWER SUPPLY	Switched-Mode Power Supply (SMPS)
15	TEMPERATURE.	The standard reference temperature for performance shall be 27^0 C. The mean temperature co - efficient shall not exceed 0.03%.
16	ISI MARK	The meters shall bear ISI Mark.

7.03 MANUFACTURING FACILITIES

7.03.01 Manufacturer shall possess fully automatic computerized Meter Test Bench System having inbuilt source and load adjustment for carrying out routine and acceptance Tests as per IS: 16444 (Part -2):2017 (amended up to date). In addition this facility shall be able to produce Test Reports for each and every Meter. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly The tenderer shall have the necessary minimum testing facilities for carrying out the following tests.

Sr. No.	Name of Test
(1)	A.C. Voltage test
(2)	Insulation Resistance Test
(3)	Test of Accuracy Requirement
(4)	Test on limits of errors
(5)	Test on meter constant
(6)	Test of starting condition
(7)	Test of no-load condition
(8)	Repeatability of error test

(9)	Test of power Consumption
(10)	Vibration test
(11)	Shock Test
(13)	Tamper conditions - as per MSEDCL, specification
(14)	Glow Wire Test
(15)	Long duration test
(16)	Flammability Test
(17)	The manufacturer shall have duly calibrated RSS meter of class 0.05 accuracy

7.03.02 METER SOFTWARE:

The bidder shall have to get appraised & obtain Capability Maturity Model Integration (CMMI)– Level III within one year from date of letter of award.

7.04 STANDARDS TO WHICH METERS SHALL COMPLY:

IS: 15959 Part 3 - Data Exchange for Electricity Meter Reading, Tariff and Load Control – companion specification for Category – "C1" Meters (amended upto date);

IS: 16444 part 2 / 2017 (amended up to date) for AC Static Transformer operated Watt-hour and VAR-hour Meters, Class 0.5 S – Specification.

CBIP Tech-Report - 325 amended up to date for AC Static Transformer operated Watt Hour & VAR-Hour Meters (class 0.5S);

IS: 15707 / 2006 Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice;

CEA regulations and MERC guidelines with latest amendments.

The specification given in this document supersedes the relevant clauses of IS: 14697 / 1999 (amended up to date) wherever applicable.

The equipment meeting with the requirements of other authoritative standards, which ensures equal or better quality than the standard mentioned above, also shall be considered.

In case the bidder wishes to offer material conforming to the other authoritative standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. Copy of such standards with authentic English Translations, shall be furnished along with the offer.

In case of conflict related with communication protocol, the Indian standard IS: 15959 / 2011 Data Exchange for Electricity Meter Reading,

Tariff and Load Control – Companion Specification shall prevail upon.

For conflict related with other parts of the specification, the order of priority shall be – (i) this technical specification, (ii) 16444 part 2 / 2017 amended upto date & CBIP Tech-Report - 325. (iii) Relevant IEC.

In case of any difference between provisions of these standards, the provisions of this specification shall prevail.

7.05 CONSTRUCTIONAL REQUIREMENT

7.05.01 GENERAL MECHANICAL REQUIREMENT

The meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially.

(a) personal safety against electric shock:

(b) personal safety against effects of excessive temperature;

(c) safety against spread of fire;

(d) Protection against penetration of solid objects, dust and water.

(e) Detection of fraud / pilferage

7.05.02 The meter shall be projection type and shall be dust and moisture proof. All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

7.05.03 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non-ageing and of tested quality.

7.05.04 METER CASE

7.05.04.01 The meter base & cover shall be made out of unbreakable, high grade, fire resistant polycarbonate material so as to give it tough and non-breakable qualities. Meter base shall be opaque and meter top cover shall be transparent/ opaque.

7.05.04.02 The polycarbonate body of the meter shall conform to IS: 11731 / 1986 (FV-2 Category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS: 11000 (part 2/SEC-1) 2008 or IEC-60695-2-12, Ball pressure test as per IEC-60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2) 1986. The type test certificate shall be submitted along with the offer.

7.05.04.03 The polycarbonate base and cover of meter shall be ultra-sonically welded (continuous welding) or chemically welded so that once the meter is manufactured and tested at factory; it shall not be possible to open the cover at site except the terminal cover. The thickness of material for meter cover and base shall be 2 mm (minimum).

7.05.04.04 The meter body shall be type tested for IP51 degree of protection as per

IS: 12063 against ingress of dust, moisture & vermin. The type test certificate shall be submitted along with the offer.

7.05.04.05 The meter cover shall be secured to base by means of sealable unidirectional captive screws with two holes.

7.05.05 TERMINALS & TERMINAL BLOCK

7.05.05.01 The terminal block shall be made from high quality non-hygroscopic, fire retardant, reinforced polycarbonate / non-Bakelite material which shall form an extension of the meter case.

7.05.05.02 The material of which the terminal block is made shall be capable of passing the tests given in IS: 1336O (Part 6/Sec 17), ISO 75-1 (1993) & ISO 75-2 (1993) for a temperature of 135^{0}C and a pressure of 1.8 MPa (Method A). The type test certificate shall be submitted along with the offer

7.05.05.03 The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

7.05.05.04 The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

7.05.05.05 Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of meter shall screw into metal nuts.

7.05.05.06 All parts of every terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

7.05.05.07 Electrical connections shall be so designed that contact pressure is not transmitted through insulating material of the terminal block.

7.05.05.08 The terminals, the conductor fixing screws or the external or internal conductors shall not be liable to come into contact with terminal covers.

7.05.05.09 Two screws shall be provided in each current & potential terminal for effectively clamping the external leads or thimbles.

7.05.05.10 Each clamping screw shall engage a minimum of three threads in the terminal. The ends of screws shall be such as not to pierce and cut the conductors used.

7.05.05.11 The minimum internal diameter of terminal hole shall be as per 16444 part 2 / 2017.

7.05.05.12 The manufacturer shall ensure that the supporting webs between two terminals of the terminal block shall be sufficiently high to ensure that two neighboring terminals do not get bridged by dust and there shall not be any possibility of flash over between adjacent terminals of the terminal block

7.05.06 TERMINAL COVER

7.05.06.01 The termination arrangement shall be provided with an extended transparent terminal cover as per IS 16444 part 2 / 2017 (amended up to date) irrespective of rear connections.

7.05.06.02 The terminal cover shall be made out of same material as that of meter body. The terminal cover shall be unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The terminal cover shall be transparent.

7.05.06.03 The terminal cover shall be provided with one side hinge

7.05.06.04 The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

7.05.06.05 Independent sealing provision shall be made against opening of the terminal cover and front cover to prevent unauthorized tampering. It is necessary to provide Bidirectional screws with two holes for sealing purpose of terminal cover. The meter shall be pilfer-proof & tamper-proof.

7.05.06.06 The fixing screws used on the terminal cover for fixing and sealing in terminal cover shall be held captive in the terminal cover.

7.05.06.07 Proper size of grooves/U Cut shall be provided at bottom of this terminal cover for incoming service connections.

7.05.06.08 When the meter is mounted, no access to the terminals by any means shall be possible without breaking seals(s) of the terminal cover.

7.05.07 RESISTANCE TO HEAT AND FIRE

The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them

7.05.08 The meter shall be completely factory sealed except the terminal block cover

7.05.09 The provision shall be made on the meter for at least two seals to be put by utility user

7.05.10 A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than 10 in red colour, which reads as

"सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने वीज नोंदणी होणार.

7.05.11 A Push button facility shall be provided for high resolution reading / alternate mode of display, as brought out elsewhere in this specification. Facility of scrolling of all the reading up and down in all display mode shall be provided.

7.05.12 OUTPUT

The meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from front. The test output device shall be provided in the form of blinking LED. Resolution of the test output device shall be sufficient to enable the

starting current test in less than 10 minutes. The pulse rate of output device which is Pulse / kWh and Pulse / kVArh (meter constant) shall be indelibly provided on the nameplate.

7.06 The meter accuracy shall not be affected by external AC / DC / permanent magnetic field as per CBIP Technical Report 325 with latest amendments. If the meter gets affected under influence of any magnetic field (AC / DC / Permanent), then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy maximum value current (Imax) and reference voltage at unity power factor.

7.06.10 The meter shall also be capable to withstand and shall not get damaged if phase to phase voltage is applied between phases & neutral for five minutes.

7.06.11 In meter, power supply unit shall be micro control type instead of providing conventional transformer and then conversion to avoid magnetic influence. Power supply shall immune to magnet influence.

7.06.12 Non specified display parameter in the meter shall be blocked and it shall not be accessible for reprogramming at site.

7.06.13 Complete metering system shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc.

7.06.14 CTs are to be provided with magnetic shielding and they shall be tested separately prior to assembly.

7.06.15 PCB used in meter shall be made by Surface Mounting Technology.

7.06.16 REAL TIME INTERNAL CLOCK (RTC):

The real time clock shall be used in the meter for maintaining time (IST) and calendar. The RTC shall be non - rechargeable and shall be pre-programmed for 30 Years Day / date without any necessity for correction. The maximum drift shall not exceed +/- 300 Seconds per year. Facility for adjustment of real time shall be provided through CMRI with proper security.

The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following:

a) Hand Held Terminal (HHT) or Meter testing work bench and this shall need password enabling for meter;

b) From remote server through suitable communication network or Sub-station data logger “PC”.

The RTC battery & the battery for display in case of power failure shall be separate.

Event log for changes in RTC shall be available with Date & Time.

7.06.17 The meter shall withstand any type of High Voltage and High Frequency

surges which are similar to the surges produced by induction coil type instruments without affecting the accuracy of the meter. The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 KV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

(i) On any of the phases or neutral terminals

(ii) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)

(iii) At any place in load circuit.

The accuracy of meter shall be checked before and after the application of above device.

7.06.18 SELF DIAGNOSTIC FEATURES:

(i) The meter shall keep log in its memory for unsatisfactory functioning or nonfunctioning of Real Time Clock battery or low battery indication on display, also it shall be recorded and indicated in reading file at base computer software computer or to remote reading system.

(ii) All display segments: "LCD Test" display shall be provided for this purpose.

7.06.19 METER PROTOCOL:

The meter protocol shall be as per Annex E - Category D3 meters of IS 15959 part 3: 2017 amended upto date.

7.06.20 The watch dog provided shall invariably protect the hanging of microprocessor during such type of tampering devices

7.06.21 COMMUNICATION CAPABILITY:

8 The meter shall be provided with following provisions for communication of the measured / collected data as per IS 16444 Part 2: 2017 ie a communication module (4G/2G/3G/NB- IoT/PLCC/LPRF) and an Optical port complying with hardware specifications detailed in IEC 1107. This shall be used for local data downloading through a DLMS compliant HHU, Mobile Application.

Sealing arrangement for Optical & communication module as required shall be provided.

During data communication process through either AMR or MRI, the meter energy recording should not get affected.

Optical port shall support the default and minimum baud rate of 9600 bps.

Communication Module: - The smart Meter shall have bidirectional communication module which shall integrate with meter. The communication module shall accommodate 4G/2G/3G/NB-IoT for bidirectional comms with HES. Meter shall be capable to record the communication module removal as

an event.

8.05.10 The meter shall have facility to read the default display parameters during Power supply failure. For this purpose an internal battery may be provided.

8.05.11 The internal battery shall be Ni-mh or Li-ion or NI CD maintenance free battery of long life of 10 years. A suitable Push Button arrangement for activation of this battery shall be provided. Non Rechargeable (Primary Battery) shall also be accepted battery alternatively, push button provided for displaying alternate mode (On Demand Mode) parameters shall also be acceptable for activation of battery during power OFF condition.

8.05.12 Wire / Cable less design: The meter PCB shall be wirel ess to avoid improper and loose connections/ contacts.

8.05.13 The Meter shall record and display total energy including Harmonic energy.

8.05.14 The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

8.05.15 Reverse reading lock of main kWh and kVAh reading is to be incorporated with necessary software modification if required additionally.

7.06 DEMAND INTEGRETION PERIOD:

The maximum demand integration period shall be set be 30 minutes by block window method.

7.07 MD RESET:

The meter shall have following MD resetting options.

i) Communication driven reset;

ii) Manual resetting arrangement with sealing facility;

iii) Automatic reset on First day of every month at 00.00 Hrs - This option shall be blocked by default and made programmable through hand held terminal / CMRI for the actual date required.

7.08 TOD TIMING:

There shall be provision for at least 6 (Six) TOD time zones for energy and demand. The number and timings of these TOD time Zones shall be programmable. At present the time zones shall be programmed as below.

Zone “A”: - 00=00 Hrs. to 06=00 Hrs. and 22=00 Hrs. to 24=00 Hrs

Zone "B": - 06=00 Hrs. to 09=00 Hrs. and 12=00 Hrs. to 18=00 Hrs

Zone "C": - 09=00 Hrs. to 12=00 Hrs.

Zone "D": - 18=00 Hrs. to 22=00 Hrs.

7.09 TAMPER AND FRAUD MONITORING FEATURES

7.09.01 ANTI TAMPER FEATURES

The meter shall detect and correctly register energy only in forward direction under following tamper conditions:

(i) Change of phase sequence: The meter accuracy shall not be affected by change of phase sequence. It shall maintain the desired accuracy in case of reversal of phase sequence.

(ii) Reversal of line and load terminals: Even on interchanging the load and line wires, the meter shall register correct energy passing through the meter. The meter shall also display the energy recorded in reverse mode separately.

(iii) Drawing of current through local Earth: the meter shall register accurate energy even if load is drawn partially or fully through a local earth or record energy as prevailed electrical conditions.

(iv) The three phase meter shall continue to work even without neutral at any load condition.

(v) The three phase meter shall work in absence of any two phases, i.e. it shall work on any one phase wire and neutral, to record relevant energy.

(vi) The meter shall work without earth.

(vii) The potential link shall not be provided.

(viii) Visual indication shall be provided to safeguard against wrong connections to the meter terminals.

(ix) The meter shall be immune to the external magnetic field (AC / DC / Permanent) as per CBIP325. If the accuracy of the meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record Energy considering the maximum value current (Imax) at ref. voltage and unity PF in all the three phases.

(x) If a consumer tries to steal power by disconnecting the voltage supply of one or two phases of the meter externally or by tampering so that no voltage is available to voltage circuit of meter & normal current is flowing in these phases, the meter shall record the energy (kWh and kVAh) at Vref, current available in these phases & average power factor of remaining healthy phases. This event shall be logged (occurrence and restoration) along with instantaneous readings of

energies with date and time.

(xi) If, somehow the voltage circuit of one / two / all phase(s) of meter gets disconnected on its own due to faults in LT distribution network, the meter shall record the energy of that phase at Vref, current available in that phase & UPF.

(xii) The meter shall remain immune for the test of electromagnetic HF/RF defined. For any higher signals than the present standards and MSEDCL technical specifications indicated above, the energy meters shall be immune & accuracy of the energy meters shall not get affected.

7.09.02 TAMPER EVENTS.

7.09.02.01 The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Harmonic Distortion, Voltage / Frequency Fluctuations and Electromagnetic High Frequency Fields, etc. as per relevant IS

7.09.02.02 The meter shall record the occurrence and restoration of tamper events of current, voltages, kWh, kVAh power factor, event code, date & time etc. listed in Table 15959 part 3: 2017

7.09.02.03 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping as per table of IS: 15959 part 3: 2017 and the meter shall continuously display that the cover has been tampered

7.09.02.04 In the event the meter is tampered by remote control device (Jammer) same shall be recorded on Tamper event with date & time stamping.

7.09.02.05 The detection of the tamper event shall be registered in the tamper event register. The no. of times the tampering has been done shall also be registered in the meter

7.09.02.06 Tamper details shall be retrieved by authorized personnel through either of the following:

(i) HHT.

(ii) Remote access through suitable communication network

7.09.02.07 Minimum 300 numbers of events (occurrences & restoration with date & time) shall be available in the meter memory.

The recording of abnormal events shall be on FIFO basis. The unrestored events shall be recorded separately and shall not be deleted till they get recovered (permissible upto 3 months).

All the information of data shall be made available in simple & easy to understand format

7.09.02.08 The threshold values for various tamper are as below.

Sr. No.	Description	Occurrence (With Occ. Time 5 min.)	Restoration (With Rest. Time 5 min.)
1.	PT link Missing (Missing potential)	< 50% of Vref and current in that phase is > 1% of Ib	> 5o% of Vref
2.	Over voltage in any phase	> 115 % of Vref	<115 % of Vref
3.	Low voltage in any phase	< 70 % of Vref	> 70 % of Vref
4.	Voltage Unbalance	> 10 % Vref	< 10 % Vref
5.	CT reverse	--	--
6.	CT Open	Zero Amps in one or two phase and current in at least 1 phase is > 5% of Ib for 15 minutes	> 5 % I_b in the tampered phase for 15 min
7.	Current Unbalance	> 30 % *I_{ref} for 15 min	< 30 % *I_{ref} for 15 min
8.	Current Bypass	> 50 % Iref for 15 min	< 30 % I_{ref} for 15 min
9.	Over Current in any Phase	> 120 % I_b	< 120 % I_b
10.	Influence of permanent magnet or AC/ DC electromagnet / permanent magnet	Immediate	1 minute after removal
11.	Neutral Disturbance	--	--
12.	Power failure	Immediate	Immediate
13.	Very Low PF	--	--
14.	Meter Cover Opening	(2 to 4 mm) Immediate (Occurance only)	

*	Higher of 3 phase currents shall be taken as reference for this purpose.

7.10 QUANTITIES TO BE MEASURED & DISPLAYED

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for poly phase balanced or unbalanced loads:

a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVAr, power factor, frequency etc. as per details given in the table below and IS 15959 part 3: 2017.

b) Block Load Profile Parameters such as kVAh / kWh / kVArh (lag) /kVArh(lead) / Maximum Demand (MD) in kW / kVA /power factor /phase and line voltages / currents etc. as per details given in the table below and IS 15959 part 3: 2017.

c) Billing Profile Parameters such as cumulative energy kWh / cumulative kVAh / cumulative energy kVArh (lag and lead), etc. as per details given in the table below and IS 15959 part 3: 2017.

In addition to above, the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters respectively of IS15959 part 3: 2017.

7.11 DISPLAY OF MEASURED VALUES

7.11.01 DISPLAY INDICATORS

The supply indication shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the meter. In case of non available of voltage to any phase(s), the LEDs of that particular phase shall stop glowing on the LCD display of meter

7.11.02 The permanently backlit display shall show relevant information about the parameters to be displayed. The corresponding non-volatile memory shall have a minimum retention time of 10 years. In the case of multiple values presented by a single display, it shall be possible to display the content of all relevant memories. When displaying the memory, the identification of each parameter applied shall be possible. The principal unit for the measured values shall be the kilowatt-hour kWh for active energy, kVArh for reactive energy and kVAh for apparent energy.

7.11.03 The meter shall have minimum 6 digits (with +/- indication) parameter identifier, permanently backlit Liquid Crystal Display (LCD) with wide viewing angle. The size of digit shall be minimum 10x5 mm. The decimal units shall not be displayed in auto scroll mode. However it shall be displayed in push button mode or alternate mode for high resolution display for testing. Auto display cycling push button is required with persistence time of 9 Seconds. LCD shall be suitable for temperature withstand of 70^0 C; the adequate back up arrangement for storing of energy registered at the time of power interruption shall be provided.

7.11.04 The meters shall be pre-programmed for following details.

a) Voltage Rating: 415 V Ph-Ph

b) CT Ratio: 300 / 5 Amps or 400 / 5 Amps or 600 / 5 Amps or 800 / 5 Amps.

c) MD Integration Period is 30 Minutes real time based.

d) Average power factor with 2 decimal digits shall be displayed.

e) The meter shall Auto reset kVAMD at 24.00 Hrs. of last day of the month as per clause 6.07 (iii) and this value shall be stored in the memory along with the cumulative kWh and kVAh reading.

f) The array of data to be retained inside the meter memory shall be for the last 60 days for a capture period of 30 minutes. Load survey data shall be first in first out basis (FIFO).

g) The display of various electrical parameters in Normal Mode & Alternate mode shall be as per table 27 & 29 (except 8 & 9) of IS: 15959 part 3: 2017. in the sequence given as below. Display other than specified shall be blocked. The scroll period for auto scroll shall be 9 secs.

(A)	**Default Display**
1.	LCD Test
2.	Meter Sr. No.
3.	Real Time Clock – Date & Time
4.	Cumulative Energy – kWh
5.	Cumulative Energy – kWh - TOD Zone A (TZ1)
6.	Cumulative Energy – kWh - TOD Zone B (TZ2)
7.	Cumulative Energy – kWh - TOD Zone C (TZ3)
8.	Cumulative Energy – kWh - TOD Zone D (TZ4)
9.	Cumulative Energy – kVArh - Lag
10.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)
11.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)
12.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)
13.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)

14.	Cumulative Energy –kVArh - Lead
15.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)
16.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)
17.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)
18.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)
19.	Cumulative Energy – kVAh
20.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
21.	Cumulative Energy – kVAh - TOD Zone B (TZ2)
22.	Cumulative Energy – kVAh - TOD Zone C (TZ3)
23.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
24.	Current MD – kVA with occurance date & time
25.	MD - kVA – TOD Zone A (TZ1) with occurance date & time
26.	MD - kVA – TOD Zone B (TZ2) with occurance date & time
27.	MD - kVA – TOD Zone C (TZ3) with occurance date & time
28.	MD - kVA – TOD Zone D (TZ4) with occurance date & time
29.	Number of MD – kVA reset
30.	Rising MD with elapsed time
31.	Three Phase Power Factor – PF
32.	Cumulative Tamper Count
33.	Meter Cover Opening –Occurance with date and time.
(B)	**On – Demand Display (Alternate Display)**
1.	Last date & time of MD - kVA reset
2.	Current – I_R
3.	Current – I_Y
4.	Current – I_B

5.	Voltage – V_R
6.	Voltage – V_Y
7.	Voltage – V_B
8.	Signed Power Factor – R Phase
9.	Signed Power Factor – Y Phase
10.	Signed Power Factor – B Phase
11.	Frequency
12.	High resolution kWh (for calibration)
13.	High resolution kVArh Lag(for calibration)
14.	High resolution kVArh Lead(for calibration)
15.	High resolution kVAh (for calibration)
16.	Rising MD with elapsed time (for calibration/testing)
17.	M1 MD - kVA – TOD Zone A (TZ1) with occurance date & time
18.	M1 MD - kVA –TOD Zone B (TZ2) with occurance date & time
19.	M1 MD - kVA – TOD Zone C (TZ3) with occurance date & time
20.	M1 MD - kVA – TOD Zone D (TZ4) with occurance date & time
21.	M2 MD - kVA – TOD Zone A (TZ1) with occurance date & time
22.	M2 MD - kVA –TOD Zone B (TZ2) with occurance date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurance date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurance date & time
25.	Last Tamper Event with date and time.

h) Other kVA MD values shall be available in reset backup data for 12 months.

i) The meter display shall return to Default Display mode (mentioned above) if the 'Push button' is not operated for 15 seconds

7.12 BILLING DATA, BILLING HISTORY & BLOCK LOAD SURVEY:

7.12.01 BILLING DATA:

The billing data shall be as per table 29 of Annex E of IS: 15959 part 3: 2017. and is summarized as below.

SR. NO.	BILLING PARAMETERS
1.	Billing Date
2.	System Power Factor for Billing Period
3.	Cumulative Energy – kWh
4.	Cumulative Energy – kWh - TOD Zone A (TZ1)
5.	Cumulative Energy – kWh - TOD Zone B (TZ2)
6.	Cumulative Energy – kWh - TOD Zone C (TZ3)
7.	Cumulative Energy – kWh - TOD Zone D (TZ4)
8.	Cumulative Energy – kVArh - Lag
9.	Cumulative Energy – kVArh - Lead
10.	Cumulative Energy – kVAh
11.	Cumulative Energy – kVAh - TOD Zone A (TZ1)
12.	Cumulative Energy – kVAh – TOD Zone B (TZ2)
13.	Cumulative Energy – kVAh – TOD Zone C (TZ3)
14.	Cumulative Energy – kVAh – TOD Zone D (TZ4)
15.	MD – kVA with occurance date & time
16.	MD – kVA – TOD Zone A (TZ1) with occurance date & time
17.	MD – kVA – TOD Zone B (TZ2) with occurance date & time
18.	MD – kVA – TOD Zone C (TZ3) with occurance date & time
19.	MD – kVA – TOD Zone D (TZ4) with occurance date & time

7.12.02 BILLING HISTORY:

The meter shall have sufficient non-volatile memory for recording history of billing parameters for last 12 months. Meter shall record the midnight snapshot of the cumulative energy values and daily MD value. Billing data shall display the history for past 60 days midnight snaps. The days

where there is no power on should not be considered

7.12.03 BLOCK LOAD SURVEY:

The Block 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, however if there is no power for few block within one day those block should be displayed with 0 values with marking of power fail indication for that block i.e. for every day when there was power on, **the meter must record 48 blocks**. Whenever meter is taken out and brought to laboratory, the load survey data shall be retained for the period of actual use of meter. This 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 (Excel sheet).

The Block Load survey data shall be for specified parameters as per table for 3Φ/4W system of measurement with NEUTRAL as reference point of Annex E of IS: 15959 part 3: 2017 The specified parameters are summarized as below.

SR. NO.	BLOCK LOAD SURVEY PARAMETERS
1.	Real time clock, date and time
2.	Current, I_R
3.	Current, I_Y
4.	Current, I_B
5.	Voltage, V_{RN}
6.	Voltage, V_{YN}
7.	Voltage, V_{BN}
8.	Block energy, kWh
9.	Block energy, kVArh (lag)
10.	Block energy, kVArh (lead)
11.	Block energy, kVAh

7.13 DEMONSTRATION:

The purchaser reserves the right to ask to give the demonstration of the equipment offered at the purchaser's place.

7.14 PERFORMANCE UNDER INFLUENCE QUANTITIES:

7.05.05.13 The meters performance under influence quantities shall be governed by IS: 16444 part 2 / 2017. (amended upto date)

7.05.05.14 The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS: 16444 part 2 / 2017 (amended upto date).

7.15 COMPUTER SOFTWARE :

7.16.01 For efficient and speedy recovery of data downloaded through HHU on base computer, licensed copies of base computer software shall have to be supplied free of cost. This software will be used at number of places up to Division level. As many copies of base computer software as required up to Division level shall be provided by Supplier.

7.16.02 The meter shall be capable to communicate directly with laptop computer. Base Computer Software shall be suitable for all types of printers such as dot matrix, inkjet, deskjet and laser printers.

7.16.03 The Base Computer Software shall be "Windows" based & user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer as well as HHT by any means). The software shall have capability to convert all the data into ASCII format/XML format as per MIOS.

7.16.04 The Base Computer Software should be password protected.

7.16.05 The total time taken for downloading Billing, Tamper and Load Survey Data for 60 days shall be less than or equal to 8 minutes.

7.16.06 Downloading time of only Billing data shall be less than or equal to 20 secs.

7.16.07 The BCS software shall create one single file for the uploaded data, e.g. if CMRI contains the meter readings of, say, 2,000 consumer meters and the said data is uploaded to BCS, then the BCS shall create a single file containing separate records for each consumer meter reading in ASCII format or XML file as per MIOS for individual meter reading.

7.16.08 Meter manufacturers should also need to submit Convert API (API3) as per MIOS universal standard along with Base Computer System free of cost. This API should capable of converting both data i.e. AMR data collected from Read API (API1) and MRI data collected from CMRI.

7.16.09 Also there shall be a provision to give filenames while creating the file.

7.16.10 As and when the meter manufacturer releases new or latest or advanced versions of meter hardware / firmware / software (such as Base Computer System, API3 etc), the same shall be made available to purchaser immediately on the release date free of cost. The latest version shall support all existing hardware / meters in the field. The meter manufacturer should also provide support for changes and integration of Base Computer System and API3.

7.16.11 The meter samples shall be tested by our IT Department for the time required for downloading the data as per specifications and as confirmed by the bidder.

7.16.12 Downloading software shall also be provided so as to install on our Laptop for downloading data directly on Laptop from meter without the use of HHT.

7.16.13 The software provided on laptop or PC shall be compatible to read the data from USB drive.

7.16.14 MSEDCL is procuring large quantity of meters. As such manufacturer have to depute Hardware Engineers and Software Engineers on call basis, who shall have thorough knowledge of meter hardware / software used for downloading and converting so as to discuss the problems, if any, or new development in the hardware / software with Chief Engineer, Testing & Quality Control Cell / Chief General Manager (IT), MSEDCL, Prakashgad, Bandra (E), Mumbai – 400051 without any additional charge.

7.16 CONNECTION DIAGRAM AND TERMINAL MARKING

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the above diagram. The diagram & terminal marking on sticker shall not be allowed.

7.17 NAME PLATE AND MARKING OF METERS

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. Meter Serial Number shall be Bar Coded along with numeric number. The size of bar code number shall not be less than 35x5 mm. The manufacturer's meter constant shall be marked on the name plate. Meter serial number & bar code on sticker will not be allowed. In addition to the requirement as per IS, following shall be marked on the name plate.

(i) Purchase order No & date

(ii) Month and Year of manufacture

(iii) Name of purchaser, i.e. MSEDCL

(iv) Guarantee Period as per tender document

(v) ISI mark

(vi) Category of Meter: **Category D3 – LT CT Consumer Meter**. The lettering shall be bold in 3 mm font.

(vii) A sticker label containing warning notice in Marathi language which is to be stick up on meters front cover or printed on meter name plate with easily readable font size not less than 10 in red colour, which reads as "सावधान ! मीटरला फेरफार करण्याचा प्रयत्न केल्यास अधिकतम वेगाने वीज नोंदणी होणार.

7.18 TESTS:

7.19.01 TYPE TESTS:

The meter offered shall have successfully passed all type tests described in the IS: 16444 part 2 / 2017 (Amended upto date)

The Type Test Reports shall clearly indicate the constructional features of the type tested meter. Separate type Test Reports for each offered type of meter shall be submitted along with offer.

The Type Test Certificate as per IS16444 part 2 / 2017. (Amended up to date) shall be submitted along with the offer. The Type Test certificate carried out during last five years prior to the date of offer shall be valid.

All the type test reports shall be got approved from Chief Engineer, MSEDCL, Testing & Quality Control Cell, Prakashgad, Mumbai.

All the Type Tests specified in the technical specifications and as per IS: 16444 part 2 / 2017.shall be carried out at laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as ERDA, ERTL, CPRI,YMPL etc. Type Test Reports conducted in manufacturers own laboratory though it is NABL and certified by testing institute shall not be acceptable.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix - C of Latest – standardization of AC static electrical energy meters – CBIP publication No. 325 / NPL / CQAL / ERTL / ERDA at the sole discretion of the purchaser at the purchaser's cost. The supplier shall have no right to contest the test results of the third party lab or for additional test and has to replace / take corrective action at the cost of the supplier.

Make & type of major components used in the type-tested meter shall be indicated in the QAP.

Additional acceptance test shall be submitted before commencement of supply & get approved from CE (Testing & Quality Control).

7.19.02 ACCEPTANCE & ROUTINE TESTS:

Criteria for selection for such tests and performance requirements shall be as per IS: 16444 part 2 / 2017(Amended upto date).

ALL acceptance tests as per IS: 16444 part 2 / 2017. shall be carried out on the meter.

All acceptance tests as per IS: 11731 (Part-2)/ 1986 shall be carried out on the meter body, heat deflection test as per ISO:75, glow wire test as per the IS:11000 (part 2/SEC-1) 1984 OR IEC PUB 60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test as per UL 94 or as per IS: 11731 (Part-2)/ 1986

All routine tests as per IS: 16444 part 2 / 2017.shall be carried out on all the meters.

7.19.03 ADDITIONAL ACCEPTANCE TESTS:

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 16444 part 2 / 2017. (amended up to date)

(a) OTHER ACCEPTANCE TESTS:

i) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage / problems.

ii) Meters shall be tested for tamper conditions as stated in this specification.

iii) Glow wire testing for poly-carbonate body.

iv) Power consumption tests shall be carried out.

v) The meter shall comply all the tests for external AC / DC magnetic field as per CBIP325. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out by putting the magnet on the meter body. If, during the test, the accuracy of the meter gets affected, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor in all the three phases. After removal of magnet, meter shall be subjected to accuracy test as per IS16444 part 2 / 2017. (Amended upto date). No deviation in error is allowed in the class index as per IS16444 part 2 / 2017. (amended upto date) & this specification.

vi) The meter shall withstand impulse voltage as per relevant IS.

The tests 6.19.03 (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 6.19.03 (v) to (vi) shall be carried out on one sample from first lot as per procedure laid down in IS16444 part 2 / 2017 (Amended up to date). The test report shall be got approved from Chief Engineer, Testing & Quality Control Cell before commencement of supply.

7.19.04 For influence quantities like, voltage variation, frequency variation, voltage unbalance etc. the limits of variation in percentage error shall be as per IS: 16444 part 2 / 2017.(amended up to date).

7.19 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish the particulars giving specific required details of meters in schedule `A' attached. The offers without the details in

Schedule "A" stand rejected.

7.20 PRE-DESPATCH INSPECTIONS:

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchases. The manufacturer shall offer to the inspector representing the purchaser all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The MSEDCL's representative / Engineer attending the above testing shall carry out testing as per IS: 16444 part 2 / 2017 & this specification and issue test certificate approval to the manufacturer and give clearance for dispatch.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division.

7.21 QUALITY CONTROL:

The purchaser shall send a team of experienced engineers for assessing the capability of the firm for manufacturing of meters as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works. Tender samples as per tender document shall be kept ready for assessing and testing. The tenderer has to give all facilities for carrying out the testing of these samples.

7.22 MANUFACTURING PROCESS, ASSEMBLY, TESTING:

7.23.1 Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs / Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer PCB assembly with PTH (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic pick-and-place machines, Reflow Soldering oven, for stabilized setting of the components on PCB. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub- assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of "PCB" with ICs / C-MOS components, to be restricted to bare minimum and precautions to prevent "ESD" failure to be provided. Complete assembled and soldered PCB shall undergo functional testing using computerized Automatic Test Equipment.

Test points shall be provided to check the performance of each block /

stage of the meter circuitry. RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

7.23.2 MANUFACTURING ACTIVITIES:

Quality should be ensured at the following stages:

a) At PCB manufacturing stage each board shall be subjected to computerized bare board testing.

b) At insertion stage all components should undergo computerized testing for conforming to design parameters and orientation.

c) Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipments (ATEs)

d) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters shall be kept in ovens for 72 hours at 55 0C temperature and atmospheric humidity under real life condition at it's full load current. After 72 hours meters shall work satisfactory to eliminate infant mortality.

e) The calibration of meters shall be done in-house.

f) The bidders shall submit the list of all imported & indigenous components separately used in meter along with the offer.

g) Bought out items:- A detailed list of bought out items which are used in the manufacture of the meter shall be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

h) List of Plant and Machinery:

Sr. No.	List of Plant and Machinery used for Energy meter Production	
1	Fully automatic testing Bench with ICT for testing link less meters	Routine Testing and Calibration of Meters
2	Semiautomatic testing Bench with MSVT	Routine Testing and Calibration of Meters
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing

7	Reference Meters Class 0.01 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meters
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO -E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts

27	Vibration testing Machine	Vibration testing of Meters
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meters
30	Short term over Current testing setup	Type testing of Meters
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meters
33	Composite Environmental testing chambers	Type testing of Meters

7.23 COMPONENT SPECIFICATION:

As per Annexure - I enclosed.

8.00 TECHNICAL SPECIFICATIONS OF CURRENT TRANSFORMERS:

8.01 The Current Transformers shall be resin cast, copper wound primary type confirming to IS: 16227 (amended upto date). Four CTs including one for Neutral shall be casted as one unit.

8.02 The CT set shall comprise of 4 Nos of CTs (for three phases and neutral circuits) moulded separately in resin cast epoxy or equivalent insulating materials. In the event of failure of one CT, it shall be individually replaced.

8.03 Technical parameters:

a) Type : Epoxy moulded Ring Type CTs
b) Primary Current : 300 Amps or 400 Amps or 600 Amps or 800 Amps
c) Secondary current : 5A
d) Rated continuous thermal factor : 1.2 times
e) Rated voltage : 415 Volts
f) Frequency : 50 Hz
g) Accuracy Class : 0.5s
h) Limits of Error (Current) : As per IS: 16227
i) Limits of Error (Phase displacement) : As per IS:16227
j) Rated burden : 5 VA
k) Instrument Security Factor : ≤ 5
l) Power frequency withstand voltage for secondary : 3 KV rms for 1 minute
m) Impulse withstand Voltage : As per relevant IS
n) Short time withstand current / duration 25 KA for 1 Seconds
o) Temperature rise (Maximum) 70° C

8.04 The accuracy class of the measuring current transformers shall be 0.5s as

per the technical requirements

8.05 The CT shall have multi stranded flexible Cu wires of adequate rating and length for secondary side of the CTs.

8.06 The CT shall be capable of continuous operation of rated output under the operating conditions of voltage and frequency variations as per statutory limits governed by relevant Indian Standard and its amendments in force

8.07 Bar Primary:

8.07.01 The bar shall be fabricated from flat EC grade virgin copper bar. The dimensions of the bar primary shall be marked on the drawing to be submitted by the manufacturer

8.07.02 The manufacturer shall provide good quality GI bolts & nuts of appropriate size for tightening the power cables to the same

8.08 Secondary terminals:

8.08.01 The design and size of the secondary studs shall be such that the terminals are suitable to carry up to 10 Amps continuously.

8.08.02 The manner of fixing the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating

8.09 The complete type tests enumerated in following table as per relevant IS: 16227 (Part 1 & 2) / 1992 amended up to date shall be submitted and got approved from the Office of the Chief Engineer, Testing & Quality Control Cell, MSEDCL, 5th Floor, Prakashgad, Bandra (E), Mumbai – 400 051 as per the tender conditions.

Sr. No.	Name of Test.
1)	Over Voltage Inter-Turn Test
2)	Verification of Terminal Marking & Polarity
3)	Determination of Errors according to the requirements of the appropriate accuracy class
4)	Lightning Impulse Voltage Withstand test
5)	Power Frequency Dry Withstand Test on Primary Winding
6)	Power Frequency Dry Withstand Test on Secondary Winding
7)	Temperature rise test
8)	Instrument Security Factor Test
9)	Short Time Current Test

9.00 TECHNICAL SPECIFICATIONS OF MOULDED CASE CIRCUIT BREAKERS (MCCBs):

9.01 The LT moulded case circuit breakers (MCCBs) shall be generally conforming to IS: 13947 / 1993 as amended upto date.

9.02 The rated current of MCCBs shall be 400 Amps for 300/5 Amps & 400/5 Amps meter, 630 Amps for 600/5 Amps meter & 800 Amps for 800/5 Amps meter

9.03 The MCCB offered shall be type tested at any NABL Lab in accordance with IS: 13947 / 1993 amended upto date.

9.04 A copy of complete Type Test reports for offered MCCBs shall be submitted along with the offer, failing which the offer shall be rejected. The type test report shall not be more than 5 (Five) years old at the time of submission of offer.

9.05 The complete type tests as per relevant IS 13947 / 1993 amended up to date and additional test as per clause no. 8.06 of this specification (Verification of time current characteristics) shall be submitted and got approved from the Chief Engineer, Testing & Quality Control Cell, MSEDCL, Prakashgad, Mumbai – 400 051 as per the tender conditions.

9.06 The MCCBs shall be manually independent and shall have quick make quick brake mechanism. The detailed specification for MCCBs shall be as under.

Sr. No.	Rated current	400 Amps/630 Amps/800 Amps
(1)	Fixed overload release setting (AMP)	100 Amps
(2)	No. of poles	3
(3)	Rated service short circuit breaking capacity (KA) which is equal to ultimate breaking capacity as per IS 13947. (The sequence of operation for this test shall be O - t - CO - t - CO, and t = 3 min.) The test shall be done at 240 V at 0.4 PF. Voltage rating phase to phase 415 V and phase to earth 240 V.	7.5 KA at 0.4 PF
(4)	Power factor for short circuit (Max.)	--- 0.4 (lag) ---

(5)	Utilization category	A

9.07 All nut bolts used for assembly and connections shall be of non-magnetic stainless steel only.

9.08 The LT MCCBs shall have the following time current characteristics.

Multiples of Normal Current Setting	Tripping time
1.05	More than 2.5 hrs.
1.2	More than 10 minutes and less than 2 hrs.
1.3	Less than 30 minutes.
1.4	Less than 10 minutes.
2.5	Less than 1 minute
4.0	Not less than 2 seconds.
6.0	Less than 5 seconds.
12.0	Instantaneous (less than 40 milliseconds).

9.09 For above time / current characteristics, the reference calibration temperature of the breaker shall be 50^0C. Duration, if any, upto 60^0C ambient temperature shall not exceed 10% of the current settings indicated above.

9.10 The short circuit breaking capacity as specified above shall be based on the short circuit test carried out at specified power factors.

For the purpose of this test, the following operation sequence shall be followed:

Break-3 minutes interval-make break-3 minutes interval-make break.

While the above stipulation regarding the test of power factor and the sequence of operation shall be binding, the other procedure for making the short circuit test and circuit etc. shall generally be in accordance with Indian

9.11 MCCB shall have locking facility in “OFF”position.

10.00 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall furnish particulars giving specific required details of the CT Operated Metering Cabinet, CT Operated Meters, CTs & MCCBs in schedule “A” attached. The offers without duly the details in Schedule `A'

stands rejected.

11.00 PROTOTYPE & DRAWINGS:

The successful tenderer shall have to manufacturer the prototype Cabinet for each rating as per these specifications before bulk manufacturing. The tenderer shall intimate the readiness of prototype to the Chief Engineer, Material Management Cell. The representative of the Chief Engineer, Material Management Cell shall inspect the prototype on any day within 15 days from the date of readiness intimated. The inspection report of prototype jointly signed by manufacturer and MSEDCL representative along with the drawings shall be submitted by the tenderer to the Chief Engineer, Material Management Cell. The Tenderer shall submit the final drawings in line with these specifications and the prototype to the Chief Engineer, Material Management Cell for approval before bulk manufacturing. The approval of prototype & drawings shall be the responsibility of tenderer. No extra period shall be allowed for getting approval of prototype and drawing & this shall be inclusive in the period of delivery schedule given by the tenderer.

12.00 GUARANTEE:

The equipments supplied shall be guaranteed as per tender document. Bidders shall guarantee to repair or replace free of cost the meters, HHTs, CTs, MCCBs and meter boxes (if supplied), which are found defective / inoperative at the time of installation, or become inoperative / defective during guarantee period. Replacements shall be effected within one month from the date of intimation.

13.00 JOINT INSPECTION AFTER RECEIPT AT STORES (Random Sample Testing):

After dispatch of material against inspected lot to various store centers, the RST of sample CT operated meters shall be carried out at each store where the quantities are supplied against the inspected lot. For this purpose, two nos. of samples out of each 100 Nos. received quantity of the Metering Cabinet shall be selected for testing.

The meters shall be tested by our Executive Engineer (Testing) in presence of Supplier's representative jointly for (i) no load condition; (ii) limits of error test; (iii) starting Condition; (iv) repeatability of error test and (v) tamper conditions as per this specification. The 5 days advance intimation will be given to the supplier and if the suppliers fail to attend the joint inspection on the date informed, the Testing will be carried out by our Testing Engineer in absence of supplier's representative. If the meters failed in above random sample testing, the lot will be rejected.

For the purpose of RST of CTs & MCCBs, any one of the stores where metering cabinets are dispatched against inspected lot shall be selected by Chief Engineer, Material Management Cell and the acceptance &

routine tests shall be carried out on two numbers of CTs & MCCBs of individual rating each at the MSEDCL Testing Laboratory for the testing facilities available. The balance tests shall be carried out at the nearby third party recognized testing laboratory. The testing results of CTs & MCCBs shall be applicable to the inspected lot quantity supplied to various stores. The following tests are to be carried out as per relevant IS for MCCBs & CTs:

For MCCBs:

a. Mechanical Operation Tests.

b. Calibration of release.

c. Dielectric Tests.

For CTs:

a. Verification of Terminal marking and polarity.

b. Power frequency dry withstand test on Primary Winding.

c. Power frequency dry withstand Test on Secondary Winding.

d. Over voltage inter turn test.

e. Determination of error or other characteristics according to requirements of the appropriate designation or accuracy class.

If the single item of the meter cabinet fails in RST, the inspected lot of that particular item supplied at various stores shall be rejected.

5 days advance information shall be given to supplier for joint inspection and the date shall not be altered to the convenience or request of supplier. If the supplier / supplier's representative fails to attend on the date fixed, the RST shall be carried out in his absence & results of RST shall be binding on supplier.

14.00 SCHEDULES:

The tenderer shall fill in the following schedules, which are part and partial of the tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule „A' …. Guaranteed and technical particulars. (As per GTP uploaded on e -tendering site)

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard shall not be entertained. If it is observed that there are deviations in the offer in Guaranteed Technical Particulars, then, such deviations shall be treated as deviations.

ANNEXURE I

COMPONENT SPECIFICATION

The make/grade and the range of the components should be from the following list makes or equivalent reputed makes

Sr. No.	Component function	Requirement	Makes and Origin
1	Current Transformers	The Meters shall be with the current transformers as measuring elements.	The current transformer shall withstand for the clauses under of IS: 16444 part 2 / 2017.
2	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type along with the ASICs.	**USA:** Analog Devices, Cyrus Logic, Atmel, Philips, Teridian. Dallas, ST, Texas Instruments, Motorola, Maxim, National Semiconductors, Freescale, Onsemiconductors **Germany:** Siemens. **South Africa:** SAMES. **Japan:** NEC, Toshiba, Renasas, Hitachi. **Austria:** AMS **Holland:** Philips (N X P) **Taiwan:** Prolific Or any other reputed make.
3	Memory chips	The memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. There shall be security isolation between metering circuit, communication circuit, and power circuit.	**USA:** Atmel, Teridian, Philips ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron. **Japan:** Hitachi, Renasas. **Germany:** Siemens Or any other reputed make.

4	Display modules	(a) The display modules shall be well protected from the external UV radiations. (b) The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters. (c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type). (d) It shall be trans- reflective HTN (Hyper Twisted Nematic (120°)) or STN (Super Twisted Nematic (160°)) type industrial grade with extended temperature range.	Display TEK/KCE/RCL Display /Suzhou heng Xiamen instruments/ Veritronics **Singapore:** E-smart, Bonafied Technologies, Display Tech, **Korea:** Advantek, Jebon, Union Display Inc., **Japan:** Hitachi, Tianma, Sony, L&G, Holtek, Haijing. **Malaysia:** Crystal Clear Technology. **Hong kong:** Genda **China:** Success, Tianma. Or any other reputed make.
5	Communication Modules	Communication modules shall be compatible for the two ports (one optical port for communication with meter reading instruments & the other hardwired RS 232 port to communicate with various modems for AMR)	**USA:** HP, Optonica, National Semiconductors, **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek. Or any other reputed make.
6	Optical port	Optical port shall be used to transfer the meter data to meter reading instrument. The mechanical construction of the port shall be such to facilitate the data transfer easily.	**USA:** HP, National Semiconductors, Maxim **Holland/Korea:** Phillips **Japan:** Hitachi **Taiwan:** Ligitek. Or any other reputed make.

7	Power supply	The power supply shall be with the Capabilities as per the relevant standards. The power supply unit of the meter shall not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections	SMPS Type
8	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	**USA:** National Semiconductors, Atmel, Philips, Texas Instruments, BC Component Analog devices, ST, Maxim, Siemens, PHYCOMP, YAGEO, DRALORIC, KOA, WELWYN, OSRAM, Kemet Onsemiconductors, Freescale, Intersil, Raltron, Fairchild, Muruta, Agilent, AVX, Abracon, Sipex, Diode Inc., Honeywell, Power Integration, Fox, Roham **Japan:** Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung, Panasonic **India:** Keltron, Incap, VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic components Pvt. Ltd., Cermet, CTR. **Korea:** Samsung **Germany:** Vishay, Epcos, Diotech, Kemet, Infineon **Taiwan:** Yageo. Or any other reputed make.

9	Mechanical parts	(i) The internal electrical components shall be of electrolytic copper & shall be protected from corrosion, rust etc. (ii) The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.	
10	Battery	Chargeable/Non chargeable maintenance free guaranteed life of 10 years.	**USA:** Maxell, Renata **Japan:** Panasonic, Sony, Mitsubishi, Sanyo **Germany:** Varta, Tedirum **France:** Saft **Korea:** Tekcell, Vitzrocell. Or any other reputed make.
11	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standards.	**USA:** Philips, Dallas Atmel, Motorola, Microchip, Epson, ST, Teridian **Japan:** NEC or Oki. Or any other reputed make.
12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

ANNEXURE – II

MSEDCL DEFINED OBIS CODES FOR PARAMETERS NOT PRESENT IN IS 15959/Part 3

SR. NO.	PARAMETERS	OBIS Code						Interface Class
		A	B	C	D	E	F	No./ Attribute
1.	Cumulative Energy – kVArh - Lag- TOD Zone A (TZ1)	1	0	5	8	1	255	3/2
2.	Cumulative Energy – kVArh - Lag- TOD Zone B (TZ2)	1	0	5	8	2	255	3/2
3.	Cumulative Energy – kVArh - Lag- TOD Zone C (TZ3)	1	0	5	8	3	255	3/2
4.	Cumulative Energy – kVArh - Lag- TOD Zone D (TZ4)	1	0	5	8	4	255	3/2
5.	Cumulative Energy – kVArh - Lead- TOD Zone A (TZ1)	1	0	8	8	1	255	3/2
6.	Cumulative Energy – kVArh - Lead- TOD Zone B (TZ2)	1	0	8	8	2	255	3/2
7.	Cumulative Energy – kVArh - Lead- TOD Zone C (TZ3)	1	0	8	8	3	255	3/2
8.	Cumulative Energy – kVArh - Lead- TOD Zone D (TZ4)	1	0	8	8	4	255	3/2

SCHEDULE 'A'

GUARANTEED TECHNICAL PARTICULARS (TO BE FILLED ONLINE)

ITEM NAME	**LT CT OPERATED ENERGY METERING CABINET OF SMC COMPRISING OF RESIN CAST BLOCK TYPE CTS, MCCBS AND LT AC THREE PHASE, FOUR WIRE 300/5 AMPS OR 400/5 AMPS OR 600/5 AMPS OR 800/5 AMPS CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI - VECTOR SMART ENERGY METER**	
SR. NO.	**GTP PARAMETERS**	**GTP VALUES**
A	**LT AC THREE PHASE, FOUR WIRE 400/5 AMPS OR 600/5 AMPS OR 800/5 AMPS CT OPERATED FULLY STATIC AMR COMPATIBLE TOD TRI-VECTOR ENERGY METER AS PER CATEGORY D3**	
1.	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TO BE FILLED BY MANUFACTURER
2.	MAKE AND TYPE OF METER	TO BE FILLED BY MANUFACTURER
3.	APPLICABLE STANDARDS	IS: : 16444 part 2 / 2017.
4.	METER BEARS ISI MARK	YES
5.	FREQUENCY	50 HZ ±5%
6.	ACCURACY CLASS OF METER	0.5S (FOR ACTIVE AND REACTIVE ENERGY)
7.	RATED VOLTAGE	415 V Ph-Ph or 240 V Ph-N
8.	VOLTAGE RANGE	+15% TO – 30% OF RATED VOLTAGE.
9.	CURRENT RATING	300/ 5 AMPS OR 400/ 5 AMPS OR 600/ 5 AMPS OR 800/ 5 AMPS
10.	BASIC CURRENT (IB) OF METER	5 AMPS
11.	MAXIMUM CONTINUOUS CURRENT (IMAX)	2 TIMES (200 %) Ib

12.	SHORT TIME OVER CURRENT	AS PER IS: : 16444 part 2 / 2017.
13.	STARTING CURRENT OF METER	0.1% of Ib
14.	POWER FACTOR RANGE	ZERO LAG TO UNITY TO ZERO LEAD
15.	POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT	As PER IS 16444
16.	POWER CONSUMPTION IN EACH CURRENT CIRCUIT	As PER IS 16444
17.	POWER SUPPLY IS SMPS & MICRO CONTROL TYPE	YES
18.	STANDARD REFERENCE TEMPERATURE OF METER	27^0 C
19.	MEAN TEMPERATURE CO-EFFICIENT	SHALL NOT EXCEED 0.03%.
20.	KVA MD PROVIDED	YES
21.	OPAQUE METER BASE & TRANSPARENT/OPAQUE TOP COVER IS MADE OUT OF UNBREAKABLE, TOUGH, NON-BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE MATERIAL SO AS TO GIVE IT AND QUALITIES.	YES
22.	METER BODY IS MADE OF POLYCARBONATE	YES
23.	POLY CARBONATE BODY OF METER CONFORMS TO IS: 11731 (FV-2 CATEGORY)	YES
24.	POLY CARBONATE BODY MEETS THE TEST REQUIREMENT OF (a) HEAT DEFLECTION TEST AS PER ISO 75 > 150^0C	YES
25.	(b) GLOW WIRE TEST AS PER IS: 11000 (PART 2/SEC-1) 2008 OR IEC PUB 60695-2-12 AT 900^0C	YES
26.	(c) BALL PRESSURE TEST AS PER IEC-60695-10-2	YES
27.	(d) FLAMMABILITY TEST AS PER UL 94 OR IS 11731 (PART-2) 1986	YES
28.	TYPE TEST REPORT NOS. & DATE OF ABOVE (a) to (d)	TO BE FILLED BY MANUFACTURER

29.	PHYSICAL WATER ABSORPTION VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
30.	THERMAL HDDT VALUE OF METER BODY	TO BE FILLED BY MANUFACTURER
31.	TENSILE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
32.	FLEXURE STRENGTH OF METER BODY	TO BE FILLED BY MANUFACTURER
33.	MODULUS OF ELASTICITY OF METER BODY	TO BE FILLED BY MANUFACTURER
34.	IZOD IMPACT STRENGTH OF METER BODY NOTCHED AT 23°C	TO BE FILLED BY MANUFACTURER
35.	POLY-CARBONATE OPAQUE BASE AND TRANSPARENT/OPAQUE TOP COVER IS ULTRA-SONICALLY/CHEMICALLY WELDED (CONTINUOUS WELDING)	YES
36.	THICKNESS OF MATERIAL FOR METER COVER & BASE	2 MM MINIMUM
37.	METER BODY TYPE TESTED FOR IP51 DEGREE OF PROTECTION AS PER IS: 12063 AGAINST INGRESS OF DUST, MOISTURE & VERMIN	YES
38.	IP51 DEGREE OF PROTECTION AS PER IS: 12063 TEST CERTIFICATE NO. & DATE	TO BE FILLED BY MANUFACTURER
39.	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS WITH TWO HOLES.	YES
40.	TERMINAL BLOCK IS MADE FROM HIGH QUALITY NON-HYGROSCOPIC, FIRE RETARDANT, REINFORCED POLYCARBONATE / NON-BAKELITE MATERIAL	YES
41.	MATERIAL OF WHICH THE TERMINAL BLOCK IS MADE IS CAPABLE OF PASSING THE TESTS GIVEN IN IS: 1336O (PART 6/SEC 17), ISO 75-1 (1993) & ISO 75-2 (1993) FOR A TEMPERATURE OF 135^{0}C AND A PRESSURE OF 1.8 MPA (METHOD A)	YES
42.	TYPE TEST REPORT NOS. & DATE OF ABOVE	TO BE FILLED BY MANUFACTURER
43.	TWO SCREWS ARE PROVIDED IN EACH CURRENT & POTENTIAL TERMINAL FOR EFFECTIVELY CLAMPING THE EXTERNAL	YES

	LEADS OR THIMBLES IN TERMINAL BLOCK	
44.	MINIMUM INTERNAL DIAMETER OF TERMINAL HOLE	TO BE FILLED BY MANUFACTURER
45.	TERMINATION ARRANGEMENT IS PROVIDED WITH AN EXTENDED TRANSPARENT TERMINAL COVER AS PER CLAUSE NUMBER 6.5.2 OF IS: 16444 part 2 / 2017. (AMENDED UPTO DATE) IRRESPECTIVE OF REAR CONNECTIONS	BOOLEAN
46.	TERMINAL COVER IS UNBREAKABLE, TOUGH, NON- BREAKABLE, HIGH GRADE, FIRE RESISTANT POLYCARBONATE & IS MADE OF THE SAME MATERIAL AS THAT OF METER BODY	YES
47.	TERMINAL COVER IS TRANSPARENT	YES
48.	TERMINAL COVER ENCLOSES ACTUAL TERMINALS, CONDUCTOR FIXING SCREWS AND A SUITABLE LENGTH OF EXTERNAL CONDUCTORS AND THEIR INSULATION	YES
49.	TERMINAL COVER IS PROVIDED WITH ONE HINGE	YES
50.	INDEPENDENT SEALING PROVISION IS MADE AGAINST OPENING OF THE TERMINAL COVER AND FRONT COVER TO PREVENT UNAUTHORIZED TAMPERING	YES
51.	UNIDIRECTIONAL SCREWS WITH TWO HOLES FOR SEALING PURPOSE OF TERMINAL COVER ARE PROVIDE	YES
52.	FIXING SCREWS USED ON THE TERMINAL COVER FOR FIXING AND SEALING ARE HELD CAPTIVE IN THE TERMINAL COVER	YES
53.	PROPER SIZE OF GROOVES/U CUT PROVIDED AT BOTTOM OF TERMINAL COVER FOR INCOMING SERVICE CONNECTIONS	YES
54.	PUSH BUTTONS ARE PROVIDED AS PER SPECIFICATIONS	YES
55.	PROVISION TO PUT AT LEAST TWO SEALS BY UTILITY	YES
56.	PROVISION OF DISPLAY OF HIGH RESOLUTION READING / ALTERNATE MODE	YES

57.	OUTPUT DEVICE FOR TESTING OF METER IS BLINKING LED / LCD WITH CONSTANT PULSE RATE IS PROVIDED	YES
58.	RESOLUTION OF THE TEST OUTPUT DEVICE IS SUFFICIENT TO ENABLE THE STARTING CURRENT TEST IN LESS THAN 10 MINUTES	YES
59.	METER CONSTANT IS INDELIBLY PRINTED ON THE NAME PLATE OF THE METER	YES
60.	METER ACCURACY NOT AFFECTED BY AC / DC / PERMANENT MAGNETIC FIELD UPTO 0.27T TESLA	YES
61.	UNDER INFLUENCE OF ANY MAGNETIC FIELD ABOVE 0.27T TESLA, IF THE ERRORS ARE BEYOND PERMISSIBLE LIMITS, METER RECORDS ENERGY CONSIDERING IMAX AND REFERENCE VOLTAGE AT UNITY POWER FACTOR	YES
62.	METER IS CAPABLE TO WITHSTAND & NOT GET DAMAGED IF PHASE TO PHASE VOLTAGE IS APPLIED BETWEEN PHASES & NEUTRAL FOR FIVE MINUTES	YES
63.	TYPE OF POWER SUPPLY UNIT	SMPS
64.	NON SPECIFIED DISPLAY PARAMETERS IN ARE BLOCKED AND NOT ACCESSIBLE FOR REPROGRAMMING AT SITE	YES
65.	CTS ARE PROVIDED WITH MAGNETIC SHIELDING AND ARE TESTED SEPARATELY PRIOR TO ASSEMBLY	YES
66.	COMPLETE METERING SYSTEM DOES NOT AFFECTED BY EXTERNAL ELECTROMAFNETIC INTERFERRENCE	YES
67.	REAL TIME QUARTZ CLOCK IS USED IN METER FOR MAINTAINING TIME (IST) AND CALENDAR	YES
68.	RTC BATTERY & BATTERY FOR DISPLAY ARE SEPARATE	YES
69.	RTC BATTERY IS NON –RECHARGEABLE TYPE	YES
70.	RTC PRE - PROGRAMMED FOR 30 YEARS DAY / DATE WITHOUT ANY NECESSITY FOR	BOOLEAN

	CORRECTION	
71.	MAXIMUM DRIFT TIME OF RTC PER YEAR	SHALL NOT EXCEED +/- 300 SECONDS PER YEAR
72.	DAY / DATE SETTING & SYNCHRONISATION POSSIBLE THROUGH PASSWORD / KEY CODE	YES
73.	METER WITHSTANDS ANY TYPE OF HIGH VOLTAGE & HIGH FREQUENCY SURGES WHICH ARE SIMILAR TO THE SURGES PRODUCED BY INDUCTION COIL TYPE INSTRUMENTS WITHOUT AFFECTING THE ACCURACY OF THE METER	YES
74.	ACCURACY OF METER IS NOT AFFECTED WITH APPLICATION OF ABNORMAL VOLTAGE / FREQUENCY GENERATING DEVICE SUCH AS SPARK DISCHARGE OF APPROXIMATELY 35 KV	YES
75.	SPARK DISCHARGE OF APPROXIMATELY 35KV CARRIED OUT	YES
76.	METER LOGS UNSATISFACTORY OR	YES
77.	METERING PROTOCOL AS PER TECHNICAL SPECIFICATION	YES
78.	OPTICAL PORTS FOR COMMUNICATION AND communication module WITH SEALING ARRANGEMENT ARE PROVIDED	YES
79.	DEFAULT & MINIMUM BAUD RATE OF OPTICAL PORTS	9600 BPS
80.	INTERNAL NI-MH OR LI-ION OR NI CD MAINTENANCE FREE BATTERY OF LONG LIFE OF 10 YEARS WITH PUSH BUTTON ARRANGEMENT FOR ACTIVATION OF BATTERY OR EXTERNAL BATTERY WITH INDUCTIVE COUPLING ARRANGEMENT WITH INBUILT CHARGER IN THE RATIO OF 1 BATTERY PACK PER 50 NOS. OF METERS PROVIDED	YES
81.	METER PCB IS WIRE LESS & IS MADE BY	SURFACE MOUNTING TECHNOLOGY
82.	METER RECORDS & DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY	YES

83.	NON VOLATILE MEMORY (NVM) WITH MINIMUM RETENTION PERIOD OF 10 YEARS IS PROVIDED	YES
84.	6 (SIX) TOD TIME ZONES FOR ENERGY AND DEMAND ARE PROVIDED	YES
85.	PROVISION FOR MD INTEGRATION PERIOD OF 30 MINUTES IS MADE	YES
86.	PROVISION THROUGH COMMUNICATION I	YES
87.	PROVISION TO RESET MD THROUGH LOCAL PUSH BUTTON IS PROVIDED	YES
88.	PROVISION FOR AUTO RESET OF MD AT CERTAIN PREDEFINED PERIOD (00 Hrs) IS PROVIDED	YES
89.	ALL ANTI TAMPER FEATURES ARE PROVIDED AS PER SPECIFICATION	YES
90.	METER LOGS TAMPER EVENTS AS PER SPECIFICATION	YES
91.	DETECTION OF TAMPER NO. & TAMPER EVENT IS REGISTERED IN TAMPER EVENT REGISTER	YES
92.	METER KEEPS RECORD OF TAMPER EVENTS FOR MINIMUM 300 EVENTS ON FIFO BASIS	YES
93.	SUPPLY INDICATION IN THE FORM OF LED / LCD DISPLY IS PROVIDED	YES
94.	SUPPLY INDICATION IS VISIBLE FROM THE FRONT OF THE METER	YES
95.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) OF MINIMUM 6 DIGITS AND MINIMUM 10 MM HEIGHT AND WIDE VIEWING ANGLE IS PROVIDED	YES
96.	SIZE OF DIGITS	MINIMUM 10X5 MM
97.	AUTO DISPLAY CYCLING PUSH BUTTON WITH PERSISTENCE TIME OF 9 SECONDS IS PROVIDED	YES
98.	BACKLIT LIQUID CRYSTAL DISPLAY (LCD) IS SUITABLE FOR TEMPERATURE WITHSTAND OF 70^0C	YES

99.	PUSH BUTTON FOR HIGH RESOLUTION DISPLAY / ALTERNATE MODE OF DISPLAY IS PROVIDED	YES
100.	METER IS PROGRAMMED FOR (A) MD INTEGRATION PERIOD OF 30 MINUTES	YES
101.	(B) AVERAGE POWER FACTOR WITH 2 DECIMAL DIGITS	YES
102.	(C) AUTO RESET KVAMD AT 24.00 HRS. OF LAST DAY OF THE MONTH AS PER CLAUSE 10.00 (III) OF SPECIFICATION	YES
103.	(D) ARRAY OF DATA TO BE RETAINED INSIDE THE METER MEMORY FOR THE LAST 60 DAYS FOR A CAPTURE PERIOD OF 30 MINUTES ON FIRST IN FIRST OUT BASIS (FIFO)	YES
104.	SEQUENCE OF DISPLAY PARAMETERS IS AS PER SPECIFICATIONS	YES
105.	METER RECORDS & DISPLAYS THE QUANTITES AS PER SPECIFICATION	YES
106.	DISPLAY OTHER THAN SPECIFIED IS BLOCKED	YES
107.	OTHER KVA MD VALUES ARE AVAILABLE IN RESET BACKUP DATA FOR 12 MONTHS.	YES
108.	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF 'PUSH BUTTON' IS NOT OPERATED FOR 15 SECONDS	YES
109.	BILLING DATA IS AS PER SPECIFICATION	YES
110.	PROVISION FOR RECORDING HISTORY OF BILLING PARAMETERS FOR LAST 12 MONTHS	YES
111.	PROVISION FOR LOAD SURVEY DATA FOR EVERY 30 MINUTES AND FOR PREVIOUS 60 DAYS FOR SPECIFIED PARAMETERS ON FIFO BASIS	YES
112.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: : 15959 part 3: 2017 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES

113.	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY	YES
114.	DOWNLOADING SOFTWARE IS PROVIDED TO INSTALL ON OUR LAPTOP FOR DOWNLOADING DATA DIRECTLY ON LAPTOP FROM METER WITHOUT THE USE OF HHT	YES
115.	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 60 DAYS	SHALL BE LESS THAN OR EQUAL TO 8 MINUTES
116.	DOWNLOADING TIME OF ONLY BILLING DATA	LESS THAN OR EQUAL TO 20 SECS
117.	PERMANENT NATURE CONNECTION DIAGRAM OF THE METER IS CLEARLY SHOWN ON INSIDE PORTION OF THE TERMINAL COVER	YES
118.	DISTINCTLY MARKED NAME PLATE WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS, CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL IS PROVIDED ON METER	YES
131.	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER	YES
132.	CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE IS PROVIDED ON METER	YES
133.	METER STORES NAME PLATE DETAILS AS GIVEN IN THE TABLE 30 OF ANNEX F OF IS: : 15959 part 3: 2017 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED	YES
134.	CATEGORY OF METER AS "CATEGORY D 3 – LT CT CONSUMER METER" IN 3 MM BOLD FONT IS MARKED ON NAME PLATE	YES
135.	WHETHER METER IS TYPE TESTED	YES
136.	TYPE TEST REPORT NOS. & DATE OF METER	TO BE FILLED BY MANUFACTURER
137.	METER PROTOCOL REPORT NOS. & DATES	TO BE FILLED BY MANUFACTURER
	ALL ACCEPTANCE & ROUTINE TESTS, AS PER	YES

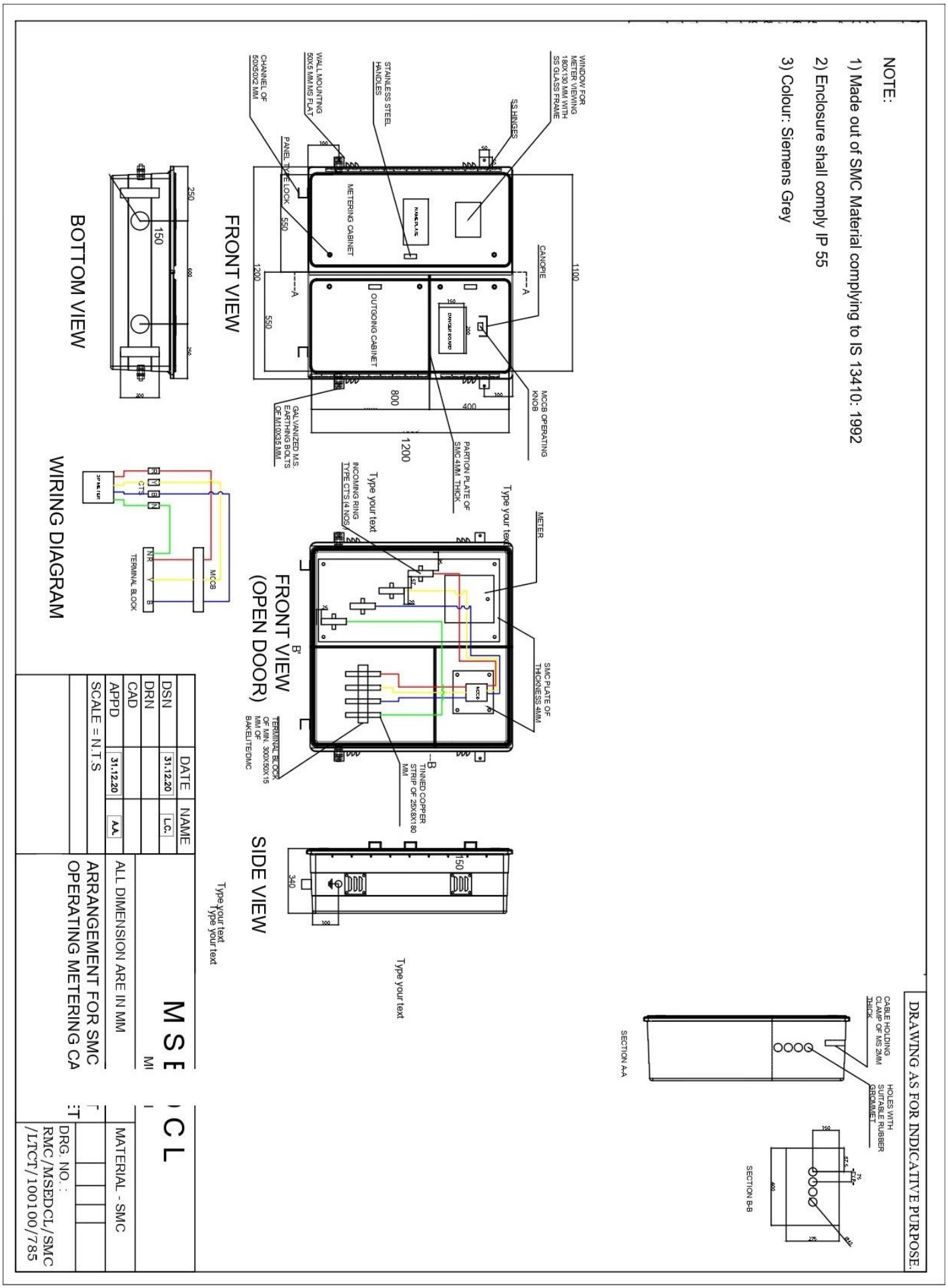
138.	IS: 16444 Part 3 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY	
140.	METER ARE GUARANTEED AS PER TENDER DOCUMENT (YES/NO)	YES
141.	GUARANTEE TO REPLACE METERS FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD	YES
142.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE	TO BE FILLED BY MANUFACTURER
143.	IN HOUSE TESTING FACILITY IS AVAILABLE FOR (A) AC VOLTAGE TEST	YES
144.	(b) INSULATION RESISTANCE TEST	YES
145.	(c) ACCURACY REQUIREMENT	YES
146.	(d) TEST ON LIMITS OF ERRORS	YES
147.	(e) TEST ON METER CONSTANT	YES
148.	(f) TEST OF STARTING CONDITION	YES
149.	(g) TEST OF NO-LOAD CONDITION	YES
150.	(h) REPEATABILITY OF ERROR TEST	YES
151.	(i) TEST OF POWER CONSUMPTION	YES
153.	(k) TAMPER CONDITIONS AS PER MSEDCL SPECIFICATION	YES
154.	(l) GLOW WIRE TEST	YES
155.	(m) LONG DURATION TEST	YES
156.	(n) FLAMABILITY TEST	YES
157.	(o) MANUFACTURER HAVE DULY CALIBRATED RSS METER OF CLASS	YES

	0.1 ACCURACY	
158.	MANUFACTURING PROCESS, ASSEMBLY, TESTING & MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION	YES
159.	AGEING TEST FOR 72 HOURS AT 55^{0}C TEMPERATURE AND ATMOSPHERIC HUMIDITY UNDER REAL LIFE CONDITION AT FULL LOAD CURRENT TO ELIMINATE INFANT MORTALITY IS CARRIED OUT	YES
160.	COMPONENT SPECIFICATION AS PER SPECIFICATION	YES
B	**RESIN CAST BLOCK TYPE LT CT**	
161.	TYPE	RESIN CAST BLOCK TYPE
162.	APPLICABLE STANDARD	IS 16227 (Part I & Part II)
163.	RATED CURRENT	300/5 A OR 400/5 A OR 600/5 A OR 800/5 A
164.	RATED SHORT TIME CURRENT	25 KA FOR 1 SECONDS
165.	RATED VOLTAGE	415 Volts
166.	FREQUENCY	50 Hz
167.	VA BURDEN	5 VA
168.	ISF OF CT	≤ 5
169.	CLASS OF ACCURACY	0.5S
170.	PRIMARY WOUND TYPE	TO BE FILLED BY MANUFACTURER
171.	NAME PLATE BODY	TO BE FILLED BY MANUFACTURER
172.	CURRENT DENSITY	MAX 1.6 AMPS/SQ.MM
173.	NUMBER OF PRIMARY TURNS	TO BE FILLED BY MANUFACTURER
174.	NUMBER OF SECONDARY TURNS	TO BE FILLED BY MANUFACTURER
175.	COLOUR OF CT'S	TO BE FILLED BY MANUFACTURER

176.	WHETHER TYPE TESTED	TO BE FILLED BY MANUFACTURER
177.	TYPE TEST REPORT NOS	TO BE FILLED BY MANUFACTURER
C	**MOULDED CASE CIRCUIT BREAKER**	
178.	TYPE	TO BE FILLED BY MANUFACTURER
179.	APPLICABLE STANDARD IS: 13947 / 1993 AMENDED UPTO DATE.	IS: 13947 / 1993 AMENDED UPTO DATE.
180.	RATED CURRENT	400 AMPS/630 AMPS/800 AMPS
181.	RATED VOLTAGE	TO BE FILLED BY MANUFACTURER
182.	RATED SERVICE SHORT CIRCUIT RATING	TO BE FILLED BY MANUFACTURER
183.	RATED SHORT CIRCUIT CAPACITY	TO BE FILLED BY MANUFACTURER
184.	OVER LOAD CURRENT SETTING	TO BE FILLED BY MANUFACTURER
185.	UTILIZATION CATEGORY	TO BE FILLED BY MANUFACTURER
186.	WHETHER TYPE TESTED	YES
187.	TYPE TEST REPORT NOS.	TO BE FILLED BY MANUFACTURER
D	**LT CT OPERATED ENERGY METERING CABINET OF SHEET SMC**	
188.	APPLICABLE STANDARD	IS:13410
189.	MATERIAL OF CABINET ENCLOSURE IS SMC (FRP MATERIAL)	YES
190.	GRADE OF SMC	S3
191.	THICKNESS OF ENCLOSURE	MIN 2.5 MM THICK
192.	COLOUR OF ENCLOSURE	SIEMENS GREY
193.	HEIGHT x WIDTH x DEPTH	TEXT
194.	MATERIAL OF TERMINAL BLOCK	BAKELITE
195.	SIZE OF TERMINAL BLOCK AS PER TECHNICAL SPECIFICATION	YES
196.	DEGREE OF PROTECTION	IP 55

197.	MATERIAL OF OUTGOING TERMINAL STRIPS	TO BE FILLED BY MANUFACTURER
198.	SIZE OF OUT GOING TERMINAL STRIPS	TO BE FILLED BY MANUFACTURER
199.	WHETHER CABINET IS TYPE TESTED	TO BE FILLED BY MANUFACTURER
200.	TYPE TEST REPORT NOS.	TO BE FILLED BY MANUFACTURER
201.	EACH CHAMBER DOOR PROVIDED WITH PANEL LOCK & TWO MASTER KEYS FOR OPENING THE DOORS	YES
202.	IN ADDITION TO PANEL LOCKS, ARRANGEMENT FOR PROVIDING PAD LOCKS IS MADE	YES
203.	HINGES ARE PROVIDED FROM INSIDE	YES
204.	FIXING ARRANGEMENT PROVIDED AT THE BACK OF ENCLOSURE.	YES
205.	THICKNESS OF THE FIXING PLATE	TEXT
206.	MINIMUM 3 MM THICK DURABLE RUBBER GASKET PROVIDED AROUND ENCLOSURE	YES
207.	ROOF IS SLOPPING DOWN BACKWARDS WITH 5 DEGREE ANGLE	YES
208.	KNOCK OUT HOLES PROVIDED ON BOTTOM.	YES
209.	SUITABLE SIZE OF BRASS CABLE GLANDS SUITABLE FOR 3½ CORE OF REQUIRED SIZE ALUMINIUM XLPE ARMOURED CABLE PROVIDED	YES
210.	SEPARATE SEALING ARRANGEMENT PROVIDED FOR METER, CT, MCCB & OUTGOING TERMINAL CHAMBER	YES
211.	INTER CONNECTING CABLE FOR CONNECTION FROM CT TO MCCB & FROM MCCB TO OUTGOING TERMINAL BLOCK IS A SINGLE CORE MULTI- STRANDED COPPER CABLE OF SIZE AS PER SPECIFICATIONS	YES
212.	DANGER BOARD IS FITTED / MOULDED ON THE ENCLOSURE	YES
213.	ALL HOLES FOR INTERNAL CONNECTIONS THROUGH WHICH CABLES \ LEADS ARE SUPPOSED TO PASS ARE PROVIDED WITH	YES

	RUBBER REELS	
214.	SEPARATE HANDLES PROVIDED TO ALL THE DOORS	YES
215.	THICKNESS OF THE OUTGOING TERMINAL BLOCK OF BAKELITE / DMC IS MINIMUM 300 X 50 X 15 MM	YES
216.	TINNED COPPER STRIP OF 25 X 8 MM & 180 MM LONG SIZE IS PROVIDED FOR OUTGOING TERMINATION OF CABLES.	YES
217.	MCCB IS SO MOUNTED THAT ITS OPERATING KNOB / LEVER CAN BE OPERATED FROM OUTSIDE WITHOUT OPENING DOOR	YES
218.	SIZE OF TOUGHENED GLASS FOR OBSERVING METER READING PROVIDED FROM INSIDE DOOR	200 X 150 X 2 MM


NOTE:
1) Made out of SMC Material complying to IS 13410: 1992
2) Enclosure shall comply IP 55
3) Colour: Siemens Grey
DRAWING AS FOR INDICATIVE PURPOSE.
FRONT VIEW
BOTTOM VIEW
WIRING DIAGRAM
FRONT VIEW (OPEN DOOR)
SIDE VIEW
SECTION A-A
SECTION B-B
WINDOW FOR METER VIEWING 180X130 MM WITH SS GLASS FRAME
SS HINGES
STAINLESS STEEL HANDLES
WALL MOUNTING 50X5 MM MS FLAT
CHANNEL OF 50X50X2 MM
PANEL TYPE LOCK
METERING CABINET
OUTGOING CABINET
CANOPIE
MCCB OPERATING KNOB
GALVANIZED M.S. EARTHING BOLTS OF M10X35 MM
PARTION PLATE OF SMC 4MM THICK
INCOMING RING TYPE CTS (4 NOS)
METER
SMC PLATE OF THICKNESS 4MM
TERMINAL BLOCK OF MIN. 300X50X15 MM OF BAKELITE/DMC
TINNED COPPER STRIP OF 25X8X180 MM
CABLE HOLDING CLAMP OF MS 2MM THICK
HOLES WITH SUITABLE RUBBER GROMMET
MCCB
TERMINAL BLOCK
Type your text
Type your text
Type your text
Type your text
Type your text
Type your text
DSN
DRN
CAD
APPD
SCALE = N.T.S
DATE
NAME
31.12.20
L.C.
31.12.20
AA.
ALL DIMENSION ARE IN MM
MATERIAL - SMC
DRG. NO. :
RMC/MSEDCL/SMC/LTCT/100100/785

LIST OF SERVICES

SR. NO.	SERVICE NAME	ACTIVITY NUMBER	UOM	SAC CODE	REQ. QTY	VERSION	MATERIAL TYPE
1	Installation Commisioning of	PM.OTH.INSTALL	Activity unit	998736	1		null

Required Documents (To be uploaded online)				
Sr. No.	NAME	SECTION	ITEM	DESCRIPTION
1	Annexure –VI : Price Bid	Price Section	Installation Commisioning	Annexure –VI : Price Bid
2	Documentary evidence for Quality Assurance Plan of Technical Specification	Technical Section	Installation Commisioning of	Documentary evidence for Quality Assurance Plan of Technical Specification
3	Guaranteed Technical Parameters (GTP) as per Technical Specifications	Technical Section	Installation Commisioning	Guaranteed Technical Parameters (GTP) as per Technical Specifications
4	Annexure –V : Commitments of tenderer / contractor	Commercial Section		Annexure –V : Commitments of tenderer / contractor
5	Annexure –VII : No Deviation Proforma	Commercial Section		Annexure –VII : No Deviation Proforma
6	Annexure –VIII : Proforma for Service Level Agreement (SLA)	Commercial Section		Annexure –VIII : Proforma for Service Level Agreement (SLA)
7	Annexure –X : Check list	Commercial Section		Annexure –X : Check list
8	Annexure – XIV : Bill of Material	Commercial Section		Annexure – XIV : Bill of Material
9	Annexure – XII : Region wise offer details	Commercial Section		Annexure – XII : Region wise offer details
10	Annexure – XIII : Consortium Agreement	Commercial Section		Annexure – XIII : Consortium Agreement
11	Manufactures Authorization for OEM	Commercial Section		Manufactures Authorization for OEM
12	ISO, IEC, CMMI Level-III & BIS Certificates and R & D certification from DSIR as per QR Clause	Commercial Section		ISO, IEC, CMMI Level-III & BIS Certificates and R & D certification from DSIR as per QR Clause of RFP
13	Notarized power of attorney in favor of appointed agent / representative.	Commercial Section		Notarized power of attorney in favor of appointed agent / representative.
14	Doc. Evid. in respect of classification of your unit as per Micro, Small and Medium Enterprises	Commercial Section		Doc. Evid. in respect of classification of your unit as per Micro, Small and Medium Enterprises Development Act 2006.
15	The bidder shall submit the undertaking certifying that you have not approached any one for undue in	Commercial Section		The bidder shall submit the undertaking certifying that you have not approached any one for undue influence
16	Certificate duly certified by C.E./C.A. that the person/entity does not have controlling stake in mo	Commercial Section		Certificate duly certified by C.E./C.A. that the person/entity does not have controlling stake in more than one entity applied for the Tender/Bid.

Sr. No.	NAME	SECTION	ITEM	DESCRIPTION
17	Documentary Evidence in support of Q.R. Cl. 2 (A) of RFP i.e. Technical Requirement	Commercial Section		Documentary Evidence in support of Q.R. Cl. 2 (A) of RFP i.e. Technical Requirement
18	Documentary Evidence in support of Q.R. Cl. 2 (B) of RFP i.e. Financial Requirement	Commercial Section		Documentary Evidence in support of Q.R. Cl. 2 (B) of RFP i.e. Financial Requirement
19	Documentary Evidence in support of Q.R. Cl. 2 (C) of RFP i.e. Meter Manufacturer	Commercial Section		Documentary Evidence in support of Q.R. Cl. 2 (C) of RFP i.e. Meter Manufacturer
20	Documentary Evidence in support of Q.R. Cl. 2 (D) of RFP i.e. System Integrator	Commercial Section		Documentary Evidence in support of Q.R. Cl. 2 (D) of RFP i.e. System Integrator
21	Undertaking as per QR clause 2 (II) & 5.2 (V) of RFP regarding declaration of debar /	Commercial Section		Undertaking as per QR clause 2 (II) & 5.2 (V) of RFP regarding declaration of debar / blacklisting
22	Annexure –IV (A) : Proforma for Bid Security (EMD)	Commercial Section		Annexure –IV (A) : Proforma for Bid Security (EMD)
23	Doc. evid. from NSIC/DIC of not crossed prescribed monetary limit/limit for invest. in plant & m/c f	Commercial Section		Doc. evid. from NSIC/DIC of not crossed prescribed monetary limit/limit for invest. in plant & m/c for mfg. entrp. resp. & are entitled for Tender fee/EMD exmpn(MSE cert /Notarized valid NSIC cert)
24	Annexure – I : Indemnity Bond for Foreign Bidder / Manufacturer	Commercial Section		Annexure – I : Indemnity Bond for Foreign Bidder / Manufacturer
25	Annexure –II : For Authorized Assignee / Nominee in case of Foreign Bidder	Commercial Section		Annexure –II : For Authorized Assignee / Nominee in case of Foreign Bidder