

TECHNICAL SPECIFICATION OF LT AC THREE PHASE, FOUR WIRE, 40 - 200 AMPS  
AMR COMPATIBLE STATIC TOD TRI-VECTOR ENERGY METER WITH IN-BUILT CT &  
MODEM (THREAD THROUGH CONCEPT) & AS PER CATEGORY-C2 OF IS: 15959/2011  
FOR COMMUNICATION

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## MATERIAL SPECIFICATIONS CELL

### TECHNICAL SPECIFICATION

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TECHNICAL SPECIFICATION NO.

CE/MMC/MSC-II/40-200A, DATE: 30.11.2018

(Revised on 18.02.2019)

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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.

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**2.00 MINIMUM TESTING FACILITIES**

2.01 Manufacturer shall possess 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.

<b>Sr. No.</b>	<b>Name of Test</b>
(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)	Transportation Test - as per MSEDCL specification
(m)	Tamper conditions - as per MSEDCL specification
(n)	Glow Wire Test
(o)	Long duration test

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(p)	Flammability Test
(q)	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 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 88 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.

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Bidder must possess 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<sup>o</sup> C
- b) Maximum ambient temperature in shade 45<sup>o</sup> C
- c) Minimum temperature of air in shade 35<sup>o</sup> C
- d) Maximum daily average temperature 40<sup>o</sup> C
- e) Maximum yearly weighted average temperature 32<sup>o</sup> C
- f) Relative Humidity 10 to 95 %
- g) Maximum Annual rainfall 1450 mm
- h) Maximum wind pressure 150 kg/m<sup>2</sup>
- 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

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		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 (I <sub>b</sub> )	40 Amps per phase
6.	MAXIMUM CONTINUOUS CURRENT (I <sub>max</sub> )	5 times (500 %) of I <sub>b</sub> . The meter shall work accurately at 120% of I <sub>max</sub> .
7.	STARTING CURRENT	0.2% of I <sub>b</sub> .
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°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

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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	(i) 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.  (ii) The apparent power taken by each current circuit, at basic current I <sub>b</sub> , reference frequency and reference temperature shall not exceed 4 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	SMPS
20.	ISI MARK	The meter so supplied must bear ISI Mark.



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**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.

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- 6.09 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.
- 6.10 **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.

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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 front 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.

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- 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.

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- 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, a push button 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 / kVAh (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 magnetic field (AC / DC / Permanent) upto 0.2 Tesla on all the sides of meter, i.e. front, sides, top and bottom of the meter as per CBIP Technical Report 88 with latest amendments. The meter shall also remain immune under the influence of magnetic field more than 0.2 Tesla. If the accuracy of the

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meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the meter shall work as per CBIP 88 for permanent magnet of 0.5T, if influenced, meter shall record energy considering maximum value current  $I_{max}$  and same shall be recorded as magnetic tamper event with date & time stamping.

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) HHU, 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 88 (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 and can be downloaded for reading through RS-232 port to read in base computer.

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- (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 through HHU 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.

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- 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.

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, on terminal block 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 GPRS enabled Modem or NB-IoT module embedded in meter body.

Modem should be compatible with data transmission over 2G, 3G, 4G/LTE. Modem should have facility for fall back to 2G/3G networks, where 4G network is not available. Modem should support both Data and SMS transmission. It should have both GSM and GPRS/EDGE features.

Modem/NB-IoT module shall be connected such that the RS-232



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port of meter shall be free for the data downloading through HHU.

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.

**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.

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**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 frozen 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.

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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 sliding window method (Sub Integration period of 10 minutes) and can be set at 15 minutes programmable (Sub Integration period of 5 minutes), if required in future.

### **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) The meter shall work without earth.
- (v) Visual indication shall be provided to safeguard against wrong

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connections to the meter.

- (vi) 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  $V_{ref}$ ) is available to voltage circuit of meter & current is flowing in that phase, the meter shall record energy at  $V_{ref}$ , current available in these phases & UPF.
- (vii) The meter shall be immune to the external magnetic field (AC / DC / Permanent) upto 0.2 Tesla. The meter shall also remain immune under the influence of magnetic field more than 0.2 Tesla. If the accuracy of the meter gets affected under the influence of magnetic field more than 0.2 Tesla, then the meter shall work as per CBIP 88 for permanent magnet of 0.5T, if influenced, meter shall record energy considering maximum value current  $I_{max}$  and same shall be recorded as magnetic tamper event with date & time stamping.
- (viii) Meter shall also be immune for tamper by application of remote loop induction device (jammer).
- (ix) 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.

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- 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 % Ib	< 120 % Ib
7.	Influence of permanent magnet or AC / DC electromagnet / permanent	Minimum 10 seconds	1 minute after removal

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	magnet		
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, kVAh, 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	Instantaneous parameters	27

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Meters	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 $\Phi$ / 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° 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**

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- (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 45 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.



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**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.

<b>Default Display Mode (Auto Scroll) (Scrolling Time 10 Secs.)</b>	
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)

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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 occurrence date & time
24.	MD - kVA – TOD Zone A (TZ1) with occurrence date & time
25.	MD - kVA – TOD Zone B (TZ2) with occurrence date & time
26.	MD - kVA – TOD Zone C (TZ3) with occurrence date & time
27.	MD - kVA – TOD Zone D (TZ4) with occurrence 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 – Occurrence 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.

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<b>Alternate Display (On - Demand Display) (Push Button mode) (Scrolling Time 6 Secs.)</b>	
1.	Last date & time of MD - kVA reset
2.	Current - I <sub>R</sub>
3.	Current - I <sub>Y</sub>
4.	Current - I <sub>B</sub>
5.	Voltage - V <sub>R</sub>
6.	Voltage - V <sub>Y</sub>
7.	Voltage - V <sub>B</sub>
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 occurrence date & time
18.	M1 MD - kVA - TOD Zone B (TZ2) with occurrence date & time
19.	M1 MD - kVA - TOD Zone C (TZ3) with occurrence date & time
20.	M1 MD - kVA - TOD Zone D (TZ4) with occurrence date & time
21.	M2 MD - kVA - TOD Zone A (TZ1) with occurrence date & time

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22.	M2 MD - kVA – TOD Zone B (TZ2) with occurrence date & time
23.	M2 MD - kVA – TOD Zone C (TZ3) with occurrence date & time
24.	M2 MD - kVA – TOD Zone D (TZ4) with occurrence date & time
25.	Last Tamper Event with date and time.
26.	Active Power- kW-R phase (Instantaneous)
27.	Active Power- kW-Y phase (Instantaneous)
28.	Active Power- kW-B phase (Instantaneous)
29.	Reactive Power- kVAr- R phase (Instantaneous)
30.	Reactive Power- kVAr- Y phase (Instantaneous)
31.	Reactive Power- kVAr- B phase (Instantaneous)
32.	Apparent Power- kVA- R phase (Instantaneous)
33.	Apparent Power- kVA- Y phase (Instantaneous)
34.	Apparent Power- kVA- B phase (Instantaneous)
35.	Phase Sequence (Instantaneous)
<p><b>Note:</b></p> <p>(1) Other kVA MD values shall be available in reset backup data for 12 months.</p> <p>(2) The meter display shall return to Default Display Mode if the "On Demand Push Button" is not operated for 15 sec.</p> <p>(3) The meter shall display the tamper meter cover open with date &amp; time in auto scroll mode along with other parameters</p>	

### **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.

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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 occurrence date & time
16.	MD – kVA – TOD Zone A (TZ1) with occurrence date & time
17.	MD – kVA – TOD Zone B (TZ2) with occurrence date & time
18.	MD – kVA – TOD Zone C (TZ3) with occurrence date & time
19.	MD – kVA – TOD Zone D (TZ4) with occurrence date & time
20.	MD – kW occurrence date & time
21.	MD – kW – TOD Zone A (TZ1) with occurrence date & time
22.	MD – kW – TOD Zone B (TZ2) with occurrence date & time

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23.	MD – kW – TOD Zone C (TZ3) with occurrence date & time
24.	MD – kW – TOD Zone D (TZ4) with occurrence 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

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(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 (HHU) 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 88. 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)**

- 16.01 To enable local reading of meters data, a DLMS 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

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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



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- 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

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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, MM 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 Five Years
- (v) ISI mark

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(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 88 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. - 304/ NPL / COAL/ 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

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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) Transportation Test**

At least 50% of the samples of the meter be tested for error at  $I_{max}$ ,  $I_b$  and 5%  $I_b$  at unity power factor and 50%  $I_{max}$  and 10%  $I_b$  at 0.5 lagging Power Factor besides checking them for starting current. This test shall be conducted on ready to install meter i.e. meter cover ultrasonically welded & sealed. After recording these errors, the meter be put in their normal packing and transported for at least 50 km in any transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation shall not exceed 1% at higher loads and 1.5% at loads below  $I_b$ .

**(b) 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

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magnetic field as per CBIP Tech Report 88 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 (b) (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre dispatch inspection.

The tests 23.03 (b) (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 88 (with latest amendments) in NABL LAB. The test report shall be got approved from the Chief Engineer, MSEDCL, Material Management Cell, 1<sup>st</sup> 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, Material Management Cell, 1<sup>st</sup> Floor, Prakashgad, Bandra (East), Mumbai – 400 051 before commencement of supply.

**(c) 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:

S N	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%	lb	1	0.7
		lb	0.5 lag	1.0
(b)	Voltage	lb	1	1.1

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	variation – 40%, + 20% & + 10%	lb	0.5 lag	1.5
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(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

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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 and HHU 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. The Power battery of the HHU shall however be guaranteed for 2 Years from the date of supply. The bidder shall ensure that battery used in the HHU shall not be of proprietary nature and it shall be available in the open market at competitive rate.

The meter, Modem, HHU found defective within above guarantee period shall be replaced / repaired by the supplier free of cost, within one month of receipt of intimation. If defective meter / HHU are not replaced / repaired 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.

## **28.00 PACKING**

28.01 The meters & HHUs 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

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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 TENDER SAMPLE**

Tenderer are required to submit 10 (Ten) nos. of sample meters of offered type as per technical specifications along with 1 no. of sample HHU and communication cable, API software, BCS, checksum logic & documentation, etc. to EE (SM) in the office of the Chief Engineer, Material Management Cell, 1<sup>st</sup> Floor, Prakashgad, Bandra (E), Mumbai – 400051 one working day 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. and testing the offered API by our IT Department as per technical specification.

The offer of those eligible bidders shall only be considered if the samples pass the tests at NABL Lab as well as necessary certification from our IT Department for the offered API.

The results of NABL Lab and the certification from IT Department for offered API 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.

**30.00 QUALITY CONTROL**



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30.01 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.

30.02 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.

**31.00 MANUFACTURING PROCESS, ASSEMBLY, TESTING**

31.01 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.

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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.

**31.02 MANUFACTURING ACTIVITIES**

Quality shall be ensured at the following stages.

31.02.1 At PCB manufacturing stage, each Board shall be subjected to computerized bare board testing.

31.02.2 At insertion stage, all components shall under go computerized testing for conforming to design parameter and orientation.

31.02.3 Complete assembled and soldered PCB shall under go functional testing using Automatic Test Equipments (ATEs).

31.02.4 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.

31.02.5 The bidders shall submit the list of all imported and indigenous components separately used in meter along with the offer.

31.02.6 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.

31.02.7 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

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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	Programmiers 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

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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, 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.

Schedule 'C' .... Tenderer Experience

The discrepancies if any between the specification and the catalogs and / or literatures submitted as part of the offer by the bidders, the

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same shall not be considered and representations in this regard shall not be entertained.

### **35.00 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

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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.

**36.00 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.

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**SCHEDULE 'C'**

**TENDERER'S EXPERIENCE**

Tenderer shall furnish here a list of similar orders executed / under execution for supply of three phase static energy meter by him to whom a reference may be made by purchaser in case he consider such a reference necessary.

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Sr. No.	Name of client	Order No. & Date	Qty. Ordered	Qty. Supplied
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NAME OF FIRM \_\_\_\_\_

NAME & SIGNATURE OF TENDERER \_\_\_\_\_

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DESIGNATION \_\_\_\_\_

DATE \_\_\_\_\_

**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



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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.

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- > 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.

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**ANNEXURE - II**

**COMPONENT SPECIFICATION**

SN	Component Function	Requirement	Makes & Origin
1.	Current Transformers	The Meters shall be with 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.	<p><b>USA:</b> Teridian, Analog Devices, Cyrus Logic, Atmel, Philips, Dallas, ST, Motorola, Texas Instruments, Maxim, Freescale, National Semiconductor, Onsemiconductors.</p> <p><b>Germany:</b> Siemens.</p> <p><b>South Africa:</b> SAMES.</p> <p><b>Japan:</b> NEC, Toshiba, Renasas, Hitachi.</p> <p><b>Austria:</b> AMS.</p> <p><b>Holland:</b> Philips (N X P)</p> <p><b>Taiwan:</b> Prolific</p>

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3.	Memory chips	<p>Memory chips shall not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges.</p> <p>Meter shall have nonvolatile 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.</p>	<p><b>USA:</b> Teridian, Atmel, Philips, ST, National Semiconductors, Texas Instruments, Microchip, Spanson (Fujitsu), Ramtron.</p> <p><b>Japan:</b> Hitachi, Renesas.</p> <p><b>Germany:</b> Siemens</p>
4.	Display modules	<p>The display modules shall be well protected from the external UV radiations.</p> <p>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).</p> <p>The construction of the modules shall be such that the displayed quantity shall not disturb with the life of display (PIN Type).</p> <p>It shall be Tran-reflective HTN or STN type industrial grade with extended temperature range.</p>	<p><b>Singapore:</b> Bonafied Technologies, Displaytech, E-smart</p> <p><b>Korea:</b> Advantek, Jebon, Union Display Inc.</p> <p><b>Hong Kong:</b> Genda</p> <p><b>China:</b> Success, Truly, Tianma.</p> <p><b>Japan:</b> Hitachi, Sony, L &amp; G.</p> <p><b>Malaysia:</b> Crystal Clear Technology.</p>
5.	Communication Modules	Communication modules shall be compatible for the two ports (one for IR port	<b>USA:</b> Agilent, HP, Fairchild, National Semiconductors,

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		for communication with meter reading instruments (HHU) & the other for the hardwired RS-232  port to communicate with various modems for AMR)	Optonica. <b>Holland:</b> Philips. <b>Korea:</b> Phillips. <b>Japan:</b> Hitachi. <b>Taiwan:</b> Ligitek
6.	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. It shall not also be affected by magnet	SMPS Type
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.	<b>USA:</b> 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

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			<p>Integration, Roham.</p> <p><b>Japan:</b> Hitachi, Oki, AVZ, Ricon, Toshiba, Epson, Kemet, Alps, Muruta, TDK, Sanyo, Samsung.</p> <p><b>India:</b> RMC, VEPL, KELTRON, Incap, PEC, Cermet, Gujarat Polyavx, Prismatic, MFR Electronic Components Pvt. Ltd, CTR.</p> <p><b>Korea:</b> Samsung</p> <p><b>Japan:</b> Panasonic</p> <p><b>Germany:</b> Kemet, Vishay, Epcos, Diotech, Infineon.</p> <p><b>Taiwan:</b> Yageo</p>
8.	Mechanical parts	<p>The internal electrical components shall be of electrolytic copper &amp; shall be protected from corrosion, rust etc.</p> <p>The other mechanical components shall be protected from rust, corrosion etc. by suitable plating / painting methods.</p>	
9.	Battery	<p>Maintenance free battery (Ni-mh or Li-ion) of long life of 10 years.</p> <p>Only non-rechargeable</p>	<p><b>USA:</b> Varta, Tedirun, Sanyo or National, Maxell, Renata.</p>

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		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.	<b>Japan:</b> Panasonic, Sony. <b>France:</b> Saft. <b>Korea:</b> Tekcell. <b>Germany:</b> Varta.
10	RTC & Micro controller.	The accuracy of RTC shall be as per relevant IEC / IS standards.	<b>USA:</b> ST, Teridian, Philips, Dallas, Atmel, Motorola, Microchip. <b>Japan:</b> NEC, Oki, Epson, Mitubishi.
11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

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**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



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**SCHEDULE 'A'**  
**GUARANTEED TECHNICAL PARAMETERS**

<b>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</b>		
<b>SR. NO.</b>	<b>PARAMETERS</b>	<b>GTP VALUES</b>
1.0	MANUFACTURER'S / SUPPLIER'S NAME AND ADDRESS WITH WORKS ADDRESS	TEXT
2.0	MAKE & TYPE	TEXT
3.0	APPLICABLE STANDARD	TEXT
4.0	METER BEARS ISI MARK (YES/NO)	BOOLEAN
5.0	ACCURACY CLASS 1.00 (YES/NO)	BOOLEAN
6.0	CURRENT RATING	TEXT
7.0	RATED BASIC CURRENT (IB)	TEXT
8.0	STARTING CURRENT	TEXT
9.0	SHORT TIME CURRENT	TEXT
10.0	RATED VOLTAGE	TEXT
11.0	VOLTAGE RANGE	TEXT
12.0	SYSTEM EARTHING	TEXT
13.0	POWER FACTOR	TEXT
14.0	STANDARD REFERENCE TEMPERATURE FOR PERFORMANCE	TEXT
15.0	MEAN TEMPERATURE CO-EFFICIENT DOES NOT EXCEED	TEXT
16.0	FREQUENCY RANGE	TEXT

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17.0	ACTIVE AND APPARENT POWER CONSUMPTION IN EACH VOLTAGE CIRCUIT AT REFERENCE VOLTAGE, REFERENCE TEMPERATURE AND REFERENCE FREQUENCY	TEXT
18.0	APPARENT POWER TAKEN BY EACH CURRENT CIRCUIT, AT BASIC CURRENT $I_B$ , REFERENCE FREQUENCY AND REFERENCE TEMPERATURE	TEXT
19.0	METER DRAWS POWER FOR WORKING OF ELECTRONIC CIRCUIT FROM PHASE & NEUTRAL.	BOOLEAN
20.0	KVA MD PROVIDED	BOOLEAN
21.0	INTEGRATION PERIOD OF KVAMD	TEXT
22.0	METER BASE & COVER IS MADE OUT OF TRANSPARENT / OPAQUE, UNBREAKABLE, HIGH GRADE, FIRE RESISTANT, HIGH IMPACT STRENGTH POLYCARBONATE MATERIAL.	BOOLEAN
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.	BOOLEAN
24.0	POLYCARBONATE BODY OF METER CONFORMS TO	BOOLEAN
	(a) IS: 11731 (FV-2 CATEGORY)	
25.0	(b) HEAT DEFLECTION TEST AS PER ISO 75,	
26.0	(c) GLOW WIRE TEST AS PER THE IS: 11000 (PART 2/SEC-1) 1984 OR IEC-60695-2-12,	BOOLEAN
27.0	(d) BALL PRESSURE TEST AS PER IEC-60695-10-2 AND	BOOLEAN
28.0	(e) FLAMMABILITY TEST AS PER UL 94 OR AS PER IS: 11731 (PART-2) 1986.	BOOLEAN

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29.0	TYPE TEST CERTIFICATE OF ABOVE SUBMITTED ALONG WITH OFFER.	BOOLEAN
30.0	TYPE TEST CERTIFICATE NO. & DATE OF ABOVE	TEXT
31.0	METER IS PROJECTION TYPE, DUST AND MOISTURE PROOF.	BOOLEAN
32.0	METER COVER IS SECURED TO BASE BY MEANS OF SEALABLE UNIDIRECTIONAL CAPTIVE SCREWS.	BOOLEAN
33.0	PROVISION IS MADE ON THE METER FOR AT LEAST TWO SEALS TO BE PUT BY UTILITY USER.	BOOLEAN
34.0	METER CONFORMS TO IP 54 OF IS: 12063 / IEC: 529 FOR PROTECTION AGAINST INGRESS OF DUST, MOISTURE AND VERMIN'S.	BOOLEAN
35.0	TYPE TEST CERTIFICATE OF IP 54 SUBMITTED ALONG WITH THE OFFER.	BOOLEAN
36.0	TYPE TEST CERTIFICATE NO. AND DATE OF IP 54	TEXT
37.0	THICKNESS OF MATERIAL FOR METER COVER AND BASE IS MINIMUM 2 MM.	BOOLEAN
38.0	METER HAS A CASE, WHICH CAN BE SEALED IN SUCH A WAY THAT THE INTERNAL PARTS OF THE METER ARE NOT ACCESSIBLE UNLESS BODY IS BROKEN.	BOOLEAN
39.0	MINIMUM THREE SETS OF SEALS, I.E. FOR PIERCING SCREWS, METER COVER AND THE FRONT DOOR ARE PROVIDED.	BOOLEAN
40.0	ANY TEMPORARY DEFORMATION OF CASE DOES NOT EFFECT THE SATISFACTORY OPERATION OF THE METER.	BOOLEAN
41.0	METER HAS FRONT-HINGED DOOR WITH SUITABLE SEALING ARRANGEMENT (SCREWS) AND TRANSPARENT WINDOW TO VIEW THE	BOOLEAN

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	DISPLAY PARAMETERS.	
42.0	FRONT DOOR CAN BE SEALED INDEPENDENTLY OVER TERMINAL COVER.	BOOLEAN
43.0	APPROACH TO READING BUTTON AND RS-232 PORT IS ONLY POSSIBLE AFTER OPENING THE FRONT COVER.	BOOLEAN
44.0	METER HAS PROVISION TO PASS CONSUMER SERVICE CABLE DIRECTLY THROUGH METER FOR MEASUREMENT.	BOOLEAN
45.0	PIERCING SCREWS ARE USED IN THE METER FOR VOLTAGE CONNECTION.	BOOLEAN
46.0	METER IS SUITABLE TO ACCOMMODATE ALUMINIUM CABLE OF 200A CURRENT CARRYING CAPACITY.	BOOLEAN
47.0	METER CONNECTION ARRANGEMENT IS SUCH THAT THERE IS NO NEED TO REMOVE INSULATION FOR CONNECTING CABLE FOR CURRENT MEASUREMENT	BOOLEAN
48.0	METER DESIGN SUPPORTS THREAD THROUGH CONCEPT WHERE CONNECTING CABLE DIRECTLY PASSED THROUGH THE METER FOR MEASUREMENT.	BOOLEAN
49.0	OFFERED METER DOES NOT HAVE PROVISION FOR METER TERMINAL CONNECTION AS WELL AS TERMINAL BLOCK.	BOOLEAN
50.0	VOLTAGE CIRCUIT AND CURRENT CIRCUIT ARE SOLIDLY CONNECTED INSIDE THE METER BODY WITHOUT ANY LINK.	BOOLEAN
51.0	A FIRM CONNECTION IS ESTABLISHED WITHIN METER CASE TO ENERGISE VOLTAGE / CURRENT CIRCUIT.	BOOLEAN
52.0	PT PIERCING SCREW COVER FOR METER IS	BOOLEAN

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	EXTENDED TYPE, WHICH CAN BE SEALED INDEPENDENTLY	
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.	BOOLEAN
54.0	SUITABLE CONNECTOR WITH MULTIPLE PIERCING TEETH ARE PROVIDED FOR PT CONNECTION	BOOLEAN
55.0	MINIMUM 3 TEETH PIERCE THE INSULATION OF THE CABLE	BOOLEAN
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.	BOOLEAN
57.0	SEALING ARRANGEMENT IS MADE WITH UNIDIRECTIONAL SCREWS WITH SINGLE HOLES	BOOLEAN
58.0	SEALS ARE PROVIDED ON FRONT SIDE ONLY.	BOOLEAN
59.0	ACCESS TO WORKING PART IS NOT POSSIBLE WITHOUT BREAKING THE SEALS.	BOOLEAN
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.	BOOLEAN
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.	BOOLEAN
62.0	PUSH BUTTON ARRANGEMENT PROVIDED AS PER SPECIFICATION	BOOLEAN

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63.0	OPERATION INDICATOR VISIBLE FROM THE FRONT & IN THE FORM OF BLINKING LED OR OTHER SIMILAR DEVICES LIKE BLINKING LCD IS PROVIDED.	BOOLEAN
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.	BOOLEAN
65.0	PULSE RATE OF OUTPUT DEVICE WHICH PULSE / KWH AND PULSE / KVARH (METER CONSTANT) IS INDELIBLY PROVIDED ON NAMEPLATE.	BOOLEAN
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.	BOOLEAN
67.0	METER ACCURACY IS NOT AFFECTED BY MAGNETIC FIELD (AC / DC / PERMANENT) UPTO 0.2 TESLA ON ALL THE SIDES OF METER, I.E. FRONT, SIDES, TOP AND BOTTOM OF THE METER	BOOLEAN
68.0	THE METER SHALL BE IMMUNE TO THE EXTERNAL MAGNETIC FIELD (AC / DC / PERMANENT) UPTO 0.2 TESLA. THE METER SHALL ALSO REMAIN IMMUNE UNDER THE INFLUENCE OF MAGNETIC FIELD MORE THAN 0.2 TESLA. UNDER INFLUENCE OF ANY MAGNETIC FIELD (AC / DC /PERMANENT) ABOVE 0.2 TESLA. IF THE ACCURACY OF THE METER GETS AFFECTED UNDER THE INFLUENCE OF MAGNETIC FIELD MORE THAN 0.2 TESLA, THEN THE METER SHALL WORK AS PER CBIP 88 FOR PERMANENT MAGNET OF 0.5T, IF INFLUENCED METER SHALL RECORD ENERGY CONSIDERING MAXIMUM VALUE CURRENT I <sub>MAX</sub> AND SAME SHALL BE RECORDED AS MAGNETIC TAMPER EVENT WITH DATE & TIME STAMPING.	BOOLEAN

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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.	BOOLEAN
70.0	MAXIMUM DRIFT OF RTC DOES NOT EXCEED +/- 300 SECONDS PER YEAR.	BOOLEAN
71.0	CLOCK DAY / DATE SETTING AND SYNCHRONIZATION IS POSSIBLE ONLY THROUGH PASSWORD / KEY CODE COMMAND FROM METER TESTING WORK BENCH OR REMOTE SERVER	BOOLEAN
72.0	RTC BATTERY & THE BATTERY FOR DISPLAY IN CASE OF POWER FAILURE ARE SEPARATE	BOOLEAN
73.0	NON-SPECIFIED DISPLAY PARAMETERS IN THE METER ARE NOT ACCESSIBLE FOR REPROGRAMMING AT SITE THROUGH ANY KIND OF COMMUNICATION	BOOLEAN
74.0	COMPLETE METERING SYSTEM & MEASUREMENT IS NOT AFFECTED BY EXTERNAL ELECTROMAGNETIC INTERFERENCE	BOOLEAN
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 PORT TO READ IN BASE COMPUTER.	BOOLEAN
76.0	METER HAS FACILITY TO READ DEFAULT DISPLAY PARAMETERS DURING POWER SUPPLY FAILURE.	BOOLEAN
77.0	INTERNAL / EXTERNAL BATTERY PROVIDED	TEXT
78.0	DOWNLOADING OF BILLING DATA THROUGH HHU IS POSSIBLE IN POWER OUTAGE CONDITION.	BOOLEAN
79.0	METER CAPABLE TO WITHSTAND PHASE-TO-PHASE VOLTAGE APPLIED BETWEEN PHASE TO	BOOLEAN

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	NEUTRAL FOR 5 MINUTES	
80.0	METER RECORDS AND DISPLAYS TOTAL ENERGY INCLUDING HARMONIC ENERGY	BOOLEAN
81.0	METER DOES NOT STOP AND RECORDS CONSUMPTION ACCURATELY EVEN ON INJECTION OF DC VOLTAGE IN NEUTRAL	BOOLEAN
82.0	35 KV SPARK DISCHARGE TEST CARRIED OUT	BOOLEAN
83.0	WIRELESS PCB IS DESIGNED	BOOLEAN
84.0	METER PROVIDED WITH A HARDWARE PORT COMPATIBLE WITH RS-232 SPECIFICATIONS FOR LOCAL DATA DOWNLOADING THROUGH A DLMS COMPLIANT HHU	BOOLEAN
85.0	SEALING PROVISION IS MADE FOR RS-232 PORT	BOOLEAN
86.0	BAUD RATE OF RS-232 PORT	BOOLEAN
87.0	1 MTR LONG CABLE PROVIDED FOR DOWNLOADING DATA ON HHU OR LAPTOP FROM RS-232 PORT	BOOLEAN
88.0	GSM (GPRS ENABLED) MODEM IS PROVIDED EMBEDDED IN THE METER BODY.	BOOLEAN
89.0	MAKE OF CHIPSET USED FOR MODEM	TEXT
90.0	MODEM CAN BE CONNECTED SUCH THAT RS-232 PORT IS FREE FOR DATA DOWNLOADING THROUGH HHU.	BOOLEAN
91.0	NON VOLATILE MEMORY OF MINIMUM RETENTION PERIOD OF 10 YEARS PROVIDED	BOOLEAN
92.0	6 (SIX) TOD TIME ZONES ARE PROVIDED FOR ENERGY AND DEMAND	BOOLEAN
93.0	METER IS CAPABLE OF REGISTERING THE TIME-OF-DAY ENERGY AND MAXIMUM DEMAND.	BOOLEAN



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94.0	THE MAXIMUM DEMAND INTEGRATION PERIOD SHALL BE SET AT 30 MINUTES.	BOOLEAN
95.0	PROVISION OF MD RESET THROUGH HHU	BOOLEAN
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.	BOOLEAN
97.0	AUTO RESTTING OPTION OF MD IS PROGRAMMABLE FOR DAY / DATE AS PER REQUIREMENT	
98.0	ALL ANTI TAMPER FEATURES INCORPORATED IN THE METER AS PER SPECIFICATION	BOOLEAN
99.0	METER DETECTS AND LOGS TAMPER EVENTS AS PER SPECIFICATION	BOOLEAN
100.0	METER KEEPS RECORD OF MINIMUM 200 ABNORMAL EVENTS ON FIFO BASIS	BOOLEAN
101.0	METER DISPLAYS SUPPLY INDICATION & CALIBRATION (PULSE INDICATION) PERMANENTLY BY LED / LCD	BOOLEAN
102.0	PERMANENTLY BACKLIT LIQUID CRYSTAL DISPLAY LCD WITH WIDE VIEWING ANGLE OF MINIMUM 45°C TO 60°C AND UP TO ONE-METER DISTANCE VISIBLE FROM THE FRONT OF THE METER IS PROVIDED.	BOOLEAN
103.0	LCD IS DESIGNED SUITABLY TO WITHSTAND TEMPERATURE OF 80°C (STORAGE) & 65°C (OPERATION).	BOOLEAN
104.0	DISPLAY DOES NOT GET AFFECTED BY ELECTRICAL AND MAGNETIC DISTURBANCES	BOOLEAN
105.0	METER HAS 7 DIGITS PARAMETER IDENTIFIER	BOOLEAN

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106.0	HEIGHT OF DISPLAY CHARACTERS FOR PRINCIPAL PARAMETERS VALUES IS NOT LESS THAN 5 MM.	BOOLEAN
107.0	SIZE OF DIGITS	TEXT
108.0	AUTO DISPLAY CYCLING PUSH BUTTON IS PROVIDED WITH PERSISTENCE TIME OF 10 SECONDS.	BOOLEAN
109.0	DEFAULT DISPLAY MODE SWITCHES TO ALTERNATE DISPLAY MODE AFTER PRESSING THE PUSH BUTTON CONTINUOUSLY FOR 5 SECONDS.	BOOLEAN
110.0	METER DISPLAY RETURNS TO DEFAULT DISPLAY MODE IF THE "ON DEMAND" PUSH BUTTON IS NOT OPERATED FOR 15 SEC.	BOOLEAN
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	BOOLEAN
112.0	METER HAS SUFFICIENT NON-VOLATILE MEMORY FOR RECORDING HISTORY OF BILLING PARAMETERS (CUMULATIVE KWH and CUMULATIVE KVAH AT THE TIME OF RESET AND KVAMD) FOR LAST 12 MONTHS.	BOOLEAN
113.0	PROVISION FOR LOAD SURVEY DATA FOR LAST 60 DAYS FOR A CAPTURE PERIOD OF 30 MINUTES ON FIFO BASIS.	BOOLEAN
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/NO)	BOOLEAN
115.0	A DLMS COMPLIANT HHU AS PER ANNEX J OF IS: 15959 / 2011 IS PROVIDED (YES/NO)	BOOLEAN
116.0	PROVISION FOR AUTO POWER SAVE IS MADE ON	BOOLEAN

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	HHU (YES/NO)	
117.0	HHU HAS 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) (YES/NO)	BOOLEAN
118.0	HHU OFFERED IS FULLY TYPE TESTED AT APPROVED NABL LABORATORY FOR (a) TESTS OF MECHANICAL REQUIREMENT SUCH AS FREE FALL TEST, SHOCK TEST, VIBRATION TEST (YES/NO)	BOOLEAN
119.0	(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 (YES/NO)	BOOLEAN
120.0	(c) TESTS FOR ELECTROMAGNETIC COMPATIBILITY (EMC) (YES/NO)	BOOLEAN
121.0	(d) TEST OF IMMUNITY TO ELECTROMAGNETIC HF FIELDS (YES/NO)	BOOLEAN
122.0	(e) RADIO INTERFERENCE MEASUREMENT (YES/NO)	BOOLEAN
123.0	TYPE TEST REPORT OF HHU SUBMITTED WITH OFFER	BOOLEAN
124.0	TYPE TEST REPORT NOS. & DATE OF HHU (YES/NO)	BOOLEAN
125.0	BASE COMPUTER SOFTWARE IS "WINDOWS" BASED & USER FRIENDLY (YES/NO)	BOOLEAN
126.0	LICENSED COPIES OF BASE COMPUTER SOFTWARE ARE SUPPLIED FREE OF COST	BOOLEAN

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127.0	METER IS CAPABLE TO COMMUNICATE DIRECTLY WITH LAPTOP COMPUTER.	BOOLEAN
128.0	BASE COMPUTER SOFTWARE IS SUITABLE FOR ALL TYPES OF DOT MATRIX & INKJET PRINTERS	BOOLEAN
129.0	NO EDITING IN TRANSFERRED DATA IS POSSIBLE ON BASE COMPUTER AS WELL AS HHU BY ANY MEANS (YES/NO)	BOOLEAN
130.0	DOWNLOADING SOFTWARE IS SUBMITTED TO INSTALL ON OUR LAPTOP / PC FOR DIRECTLY DOWNLOADING DATA FROM METER WITHOUT THE USE OF HHU (YES/NO)	BOOLEAN
131.0	SOFTWARE PROVIDED ON LAPTOP / PC IS COMPATIBLE TO READ DATA FROM USB DRIVE (YES/NO)	BOOLEAN
132.0	CABLE WITH USB TERMINATION PROVIDED (YES/NO)	BOOLEAN
133.0	TOTAL TIME TAKEN FOR DOWNLOADING BILLING, TAMPER AND LOAD SURVEY DATA FOR 60 DAYS	TEXT
134.0	DOWNLOADING TIME OF ONLY BILLING DATA	TEXT
135.0	METERING PROTOCOL AS PER CATEGORY C2 OF IS: 15959 / 2011	BOOLEAN
136.0	METER PROTOCOL REPORT NO. & DATE	TEXT
137.0	NAMEPLATE IS CLEARLY VISIBLE, EFFECTIVELY SECURED AGAINST REMOVAL AND INDELIBLY AND DISTINCTLY MARKED WITH ALL ESSENTIAL PARTICULARS AS PER RELEVANT STANDARDS NAME PLATE	BOOLEAN
138.0	METER SERIAL NUMBER IS BAR CODED WITH SIZE OF NOT BE LESS THAN 35X5 MM ALONG WITH NUMERIC NUMBER (YES/NO)	BOOLEAN
139.0	METER STORES NAME PLATE DETAILS AS GIVEN	BOOLEAN

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	IN THE TABLE 30 OF ANNEX F OF IS: 15959 / 2011 & ARE READABLE AS A PROFILE AS AND WHEN REQUIRED (YES/NO)	
140.0	MOUNTING ARRANGEMENT AS PER SPECIFICATION PROVIDED	BOOLEAN
141.0	WHETHER METER IS TYPE TESTED	BOOLEAN
142.0	TYPE TEST REPORT ENCLOSED WITH THE BID DOCUMENTS	BOOLEAN
143.0	TYPE TEST REPORT NO. & DATE	TEXT
144.0	ALL ACCEPTANCE & ROUTINE TESTS, AS PER IS: 13779 / 1999 AMENDED UPTO DATE & THIS SPECIFICATION ARE CARRIED OUT ON METER & METER BODY (YES/NO)	BOOLEAN
145.0	TRANSPORTATION TEST IS CARRIED OUT (YES/NO)	BOOLEAN
146.0	METER, MODEM AND HHU 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	BOOLEAN
147.0	GUARANTEE TO REPLACE METER / HHU FREE OF COST WHICH ARE FOUND DEFECTIVE / INOPERATIVE AT THE TIME OF INSTALLATION OR BECOME INOPERATIVE / DEFECTIVE DURING GUARANTEE PERIOD (YES/NO)	BOOLEAN
148.0	POWER BATTERY OF HHU IS GUARANTEED FOR 2 YEARS FROM DATE OF SUPPLY	BOOLEAN
149.0	10 (TEN) SAMPLE METERS OF OFFERED TYPE AS PER TECHNICAL SPECIFICATIONS ALONG WITH 1 SAMPLE HHU, API SOFTWARE, BCS, CHECKSUM LOGIC & DOCUMENTATION IS SUBMITTED ALONG WITH THE OFFER.	BOOLEAN
150.0	MANUFACTURING PROCESS, ASSEMBLY, TESTING	BOOLEAN

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	& MANUFACTURING ACTIVITIES AS PER TECHNICAL SPECIFICATION (YES/NO)	
151.0	MANUFACTURING ACTIVITIES AS PER SPECIFICATION	BOOLEAN
152.0	AGEING TEST CARRIED OUT	BOOLEAN
153.0	QUALITY ASSURANCE PLAN AS PER SPECIFICATION SUBMITTED ALONG WITH OFFER	BOOLEAN
154.0	COMPONENT SPECIFICATION IS AS PER SPECIFICATION	BOOLEAN
155.0	TWO SETS OF DRAWING CLEARLY INDICATING THE GENERAL ARRANGEMENTS, FITTING DETAILS, ELECTRICAL CONNECTIONS ETC. ARE SUBMITTED ALONG WITH THE OFFER.	BOOLEAN
156.0	TECHNICAL LEAFLETS (USER'S MANUAL) GIVING OPERATING INSTRUCTIONS ARE SUBMITTED ALONG WITH THE OFFER	BOOLEAN
157.0	THREE COPIES OF DIMENSIONAL DRAWINGS OF THE QUOTED ITEM ARE SUBMITTED ALONG WITH THE OFFER	BOOLEAN
158.0	DETAILS OF MEMORY USED IN THE METER.	TEXT
159.0	FOLLOWING IN HOUSE TESTING FACILITIES ARE AVAILABLE A. INSULATION RESISTANCE MEASUREMENT (YES/NO)	BOOLEAN
160.0	B. NO LOAD CONDITION (YES/NO)	BOOLEAN
161.0	C. STARTING CURRENT TEST (YES/NO)	BOOLEAN
162.0	D. ACCURACY TEST REQUIREMENT (YES/NO)	BOOLEAN
163.0	E. POWER CONSUMPTION (YES/NO)	BOOLEAN
164.0	F. TRANSPORTATION TEST AS PER CLAUSE NO. 20.03 (YES/NO)	BOOLEAN

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165.0	G. FULLY COMPUTERISED METER TEST BENCH SYSTEM FOR CARRYING OUT ROUTINE AND ACCEPTANCE TEST IS AVAILABLE (YES/NO)	BOOLEAN
166.0	H. MANUFACTURER HAS DULY CALIBRATED STANDARD METER OF 0.1 CLASS ACCURACY (YES/NO)	BOOLEAN
167.0	I. GLOW WIRE TESTING (YES/NO)	BOOLEAN
168.0	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	TEXT
169.0	FURNISH PHYSICAL WATER ABSORPTION VALUE	TEXT
170.0	FURNISH THERMAL HDDT VALUE	TEXT
171.0	FURNISH FLAMMABILITY VALUE	TEXT
172.0	FLAMMABILITY V2 (YES/NO)	TEXT
173.0	GLOW WIRE TEST AT 650° C (YES/NO)	TEXT
174.0	TENSILE STRENGTH	TEXT
175.0	FLEXURE STRENGTH	TEXT
176.0	MODULUS OF ELASTICITY	TEXT
177.0	IZOD IMPACT STRENGTH NOTCHED 23° C	TEXT
178.0	GPRS CONNECTIVITY FROM METER TO MSEDCL EXISTING MDAS SYSTEM ENSURED.	BOOLEAN
179.0	SNMP SUPPORT FOR MODEM	BOOLEAN