TECHNICAL SPECIFICATION FOR LT THREE PHASE ELECTRONIC TRIVECTOR ENERGY METERS (5-30A), CLASS 1.0 WITH LPRF COMMUNICATION

1.0. SCOPE :

This specification covers the design, engineering, manufacture, assembly and testing before supply and delivery at destination stores of Three Phase, 4-wire Whole Current Electronic Trivector Energy Meters of **5-30** A rating of class 1.0 accuracy with LCD display with LPRF Communication and backlit LCD as per requirement given in this specification.

The meters should be of three phase 4 wire, suitable for measuring active (kWh) energy, reactive (lag & lead kVARh) energy, apparent (kVAH) energy and MD in KW. The measurement accuracy of kWh and kVARH is of class 1.0 or higher for Tariff Metering Applications.

2.0. STANDARDS :

2.1. All meters covered under this specification shall conform to latest issues / amendments of the standards given below :

(1) Indian Standard No. IS 13779 of 1999 with latest amendments - AC Static Watt hour Meters, Class 1 – Specification.
(2) IEC 61358:1996-Acceptance inspection for direct connected meters.
(3) CBIP Specification - 304.
(4) IEC 62052&53-Particular requirements for direct connected meters.
(5) IEC 61000-4-5:2001-04-immunity tests.
(6) IS.12063 – Degree of protection for enclosures.
(7) IS.12346 –Testing equipments.
(8) IEC 62053-11, 21&61-test, requirement power consumption.
(9) IEC-61000-4, 5 & 6- EMI/EMC Withstand
(10) IS 11000- Fire hazard testing
(11) IS-9000 – BET procedures.
(12) IEC.15707, 2006- Testing & maintenance of AC meters, code of practice.
(13) IEC 62056 - Electricity Metering/equivalent open protocol(subject to approval of purchaser)
(14) Indian Standard - Data exchange for meter reading, tariff and load Control – Companion Specifications. The conformity to OBIS codes as per CPRI recommendations shall also be provided.(subject to availability of the same during bid submission)
Equipment conforming to the above standards, which ensure equal or higher quality, would also be acceptable.
(15) CEA installation and operation of meters regulations with all amendments.

2.2. In case of any conflict or discrepancy between the provisions of these standards and the provisions of this specification, the provisions contained in this specification shall prevail.

3.0 SERVICE CONDITIONS

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

3.1. Environmental Condition

- Maximum ambient temperature (degree C) 55
- Maximum ambient temperature in shade (degree C) 45
- Maximum temperature of air in shade (degree C) 35
- Maximum daily average temperature (degree C) 40
- Maximum yearly weighted average temperature (degree C) 32
- Relative Humidity (%) 10 to 95
- Maximum Annual rainfall (mm) 1450
- Maximum wind pressure (Kg/sqm) 150
- Maximum altitude above mean sea level (meters) 1200
- Isoceraunic level (days / year) 50
- Seismic level (Horizontal acceleration) 0.3g
- Climate:- Moderately hot and humid tropical climate
- Conducive to rust and fungus growth

3.2. SUPPLY SYSTEM:

The meters should be suitable for use on LT three phase 4 wire systems of rating 240 V, Solidly grounded, 50 Hz. The meter shall be suitable for balanced loads at all power factors i.e. Zero lag – Unity – Zero lead.

Sl. No.	Items	Specification
1	Type of Installation	Indoor
2	System Voltage	440V (Phase to phase) - 40% to +20%
3	Current Rating	5-30 A
4	System Frequency	50HZ +/-5%
5	Accuracy	Class 1.0
6	No. of Phases	three Phase 4 wire
7	Systems Earthing	Solidly grounded
8	Resistance to Impulse Voltage of 1: 2/50 μsec	6KV Peak
9	Test Voltage at 50Hz for 1 minute.	2 KV RMS

3.3. POWER SUPPLY VARIATION:

The extreme power supply variation, which an operating meter should withstand without damage and without degradation of its meteorological characteristics when it is subsequently operated under its operating conditions, as per IS and CBIP Standards.

VOLTAGE	440 V +20% to - 40%
CURRENT	0.2% Ib to 150% of Imax
POWER FACTOR RANGE	Zero lag – Unity – Zero lead
FREQUENCY	50 Hz + or – 5%

The limits of error for +20 to -40% Vref variations shall be as under:-

a. @ UPF 0.7% for Ib, b.@ 0.5 lag 1.0% for Ib, c.@ UPF 0.6% for 0.6 Ib&Imax with 10% 0f 3rd harmonic current in circuit.

4.0. GENERAL AND CONSTRUCTIONAL REQUIREMENTS:

Meter shall be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions.

4.1.0.Meter Case

4.1.1. The meter Case shall be made up of unbreakable high grade flame retardant poly carbonate with minimum thickness of 2 mm, and of good di-electric & mechanical strength. Meter case and external terminal cover should be injection moulded in UV stabilized poly carbonate. The moulded meter case should not change in colour, shape, size, dimension when subjected to 72 HRS on UV Test. It should with stand 650 Deg C glow wire test and heat deflection test as per ISO 75. The External Terminal Block Cover shall be kept fully transparent. The window portion should be fully transparent, unbreakable UV stabilized poly carbonate for easy reading of all the display values/ parameters and should not fade in course of time and become opaque causing inconvenient in course of time.

4.1.2. It should be compact and of reliable design to make it immune to vibrations and shocks in normal transportation and should be capable of withstanding several stresses likely to occur in actual service. The latest state of art technology of surface mounting of components etc. may be used for the purpose. The soldering if any used shall be protected against dry solders.

The construction of the meter shall be such as to permit sealing of the meter cover, the terminal cover etc. independently. It should be ensured that the internal parts are not accessible for tampering etc., without breaking the meter cover and meter seals. The meter cover should be ultrasonic welded with the meter base and there shall not be any fastening arrangements for the same. The ultrasonic welding should be continuous in nature such that no part of the periphery shall be left without bonding. This is to ensure that in case of any attempt to open the cover from the base, there should be visible evidence of opening/tampering.

Note:-Upon delivery of meters to the stores, if it is found that meters are without this provision(welding) then the payment for the entire lot will not be paid and the vendor will not be able to participate in the future tenders of the purchaser for 3 years.

4.1.3. Sealing Provision:

i) Proper sealing arrangement should be provided on the meter to make it tamper resistant and avoid mishandling by unauthorized persons. The construction of meter shall be such as to permit sealing of the meter cover in two locations i.e right & left apart from the terminal cover which is detailed elsewhere in the specification.

ii) The size of the sealing screw must be in such a way to provide one more AP-PDCL security seal along with company seal in the same screw. The sealing screw should be unidirectional This is to ensure that internal parts are not accessible for tampering without breaking the seals.

iii) One number separate sealing arrangement to the MD Reset button and separate flap for RS 232 port shall be provided.

iv) Bidder shall provide patented seals as per CEA Regulation(2006)

v) The holes for sealing wire shall be minimum 2mm dia .

4.1.4. The material of the meter case shall have the following properties:-

1. Physical water absorption(%)- max-0.35
2. Electrical dielectric strength at 90 ˚C in oil(KV/mm)-min-16
3. Thermal HDT(˚C)-min-125
4. Flammability
   a. Rating-FV2
   b. Glow wire test 650-passes IEC-60695-2-1-12&IS:11000-2-1
5. Mechanical
   a. Tensile strength(Mpa)-min-50
   b. Flexural strength(Mpa)-min-90
   c. Izod impact strength notched 23˚C(KJ/sq.m)-min-8

4.2.0. TERMINAL ARRANGEMENTS:

4.2.1. The general and construction requirements of the terminals, terminal blocks and terminal covers should be as per CBIP -304.

4.2.2. The terminals shall be clearly embossed on terminal block which is visible from distantly on terminal block for giving external connections. A diagram of connections should be provided inside the cover of terminal block.

4.2.3. TERMINAL BLOCK:

4.2.3.1. The terminal block shall be molded type made of non-hygroscopic, flame-retardant material having good dielectric & mechanical strength. The meter terminal block shall have tin-plated/ Nickel plated/ zinc plated brass terminal inserts. The terminal screws shall have flat bottom so as not to pierce the external conductor. The terminals shall be suitable rating continuously 600% of Ib. Two screws shall be provided in each incoming and outgoing terminal for effectively clamping the external leads. Each screw shall engage at least 3 threads in the terminal.

4.2.3.2. The internal diameters of the terminal holes shall accommodate a conductor having a cross section at least equivalent to the main current conductors and should not be less than 5.5 mm and shall be capable of carrying continuous current up to 600% of Ib. The manner of fixing of incoming and outgoing leads into the terminals shall be through thimbles/lugs/reducer type terminals and the supplier shall supply the same along with each meter without any extra cost. The screws shall have thread size not less than M4 and head having 4-6mm. Diameters.

4.2.3.3. The terminal block should satisfy all the conditions specified in IS:13779 and IEC 62052-11.The material of the terminal block should fulfill the requirement of following tests:

a) The flame retardant rating of VO as per UL 94 rating.
b) The glow wire test for temperature of 960 ˚C as per IS:11000(part-2/sec.1) or IEC 60695-2-1
c) Heat deflection temperature (HDT) test of 135 deg. C as per ISO 75 or ASTM D-648.
d) Ball pressure test at 125˚C as per IEC-60335-1

4.2.3.4. The terminal cover shall be extended and transparent such that when it is placed in position it is not possible to approach the connections or connecting wires. The extended terminal cover shall be of transparent one and should have a minimum length of 50 mm from terminal base. The terminal shall have a suitable construction with barriers and covers to provide secure and safe connections. The terminal cover should have one No. security sealing provisions. The seal wire hole should be suitable for wire size of 18SWG. Provision for seal should be made in front side of the meter terminal cover.

4.2.3.5. The terminal cover shall be engraved/ embossed with the logo of manufacturer.

4.2.3.6 The extended terminal cover shall be transparent fixed to the meter terminal block by two screws. The screws should not be detachable from the cover and shall have provision for sealing. The terminal cover extension shall be designed such that cable and cable glands are covered completely inside the box to avoid mishandling of the cables by unauthorized persons.

4.2.3.7 **Terminal Arrangement**: The terminal arrangement and connection diagram shall be marked in accordance with clause 7.2 of IS 13779. Terminal arrangement shall be in sequence RPh(in), RPH(out), YPh(in), YPh(out), BPh(in), BPh(out), Neutral (in), Neutral(out)

4.3.0. FIXING ARRANGEMENT OF METER

4.3.1. The meter shall have minimum three fixing holes, one at the top for mounting and two at the bottom, inside the terminal cover. The top hole shall be key-hole type on the back of the meter base so that hanging screw is not accessible after fixing meter and it shall be not possible to remove the meter from the hanging screw without removing the terminal cover and screws behind the terminal block cover. The lower fixing holes shall be provided under ETBC. All the fixing holes shall be such designed that once meter is mounted; the screw heads shall not be accessible.

4.3.2. The vendor shall provide the appropriate fixing screws along with the meters.

4.4.0. CT's/SHUNT ARRANGEMENT

4.4.1. The meter shall operate on CT or shunt. The current circuit shall be appropriately insulated and designed to withstand the temperature rise of 50˚C over the ambient at maximum current. Specific confirmation to be submitted by the vendor that the accuracy of measurement will not suffer due to utilization of shunt on account of thermal variation and temperature coefficient up to an operational temperature of 80˚C and shall comply with IS:13379(cl.9.4).The CTs shall have proper magnetic shield and shall be mounted firmly without any movement.

4.4.2. Unlike a CT whose primary is isolated from the metering circuit shunt elements which are connected along with line side and metering side high resonance is possible making the system more vulnerable under external influence of ES and magnetic field. Hence the vendors offering meters with shunt method of current reduction are to submit the details of the shunt and how they are protected against external influences & temperature variations.

4.5.0.POWER CONSUMPTION:

4.5.1.VOLTAGE CIRCUIT:

The active and apparent power consumption in each voltage circuit including the supply of meter at reference voltage, reference temperature and reference frequency shall not increase 1.5 watt and 8 VA.

4.5.2. CURRENT CIRCUIT:

The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall not exceed 1VA.

4.5.3. MAXIMUM CURRENT:

The maximum withstanding current of the meter is 600% Ib. The meter should start registration of energy at 0.2% basic current (Ib) in main element.

4.5.4. RUNNING WITH NO LOAD:

When 70% and 120% of rated voltage is applied with no current flowing is current circuit, the test output of meter shall not produce more than are pulse/count. The minimum test period for this test shall be as per CBIP-304.

4.5.5.SHORT TIME CURRENT:

The meter shall be able to carry short time user current of 30 Imax. for are half cycle at rated frequency.

4.5.6. INITIAL START OF THE METER:

The meter shall be fully functional at the instant after the rated voltage is applied to the meter terminals.

4.6. Super capacitor

The meter shall have a super capacitor with sufficient capacity to enable the meter reader to take reading under power off condition with following provisions:

Suitable rechargeable super capacitor back up for continuous display for 48 hours from instant of power failure. The display should be powered up through push button only when power failure occurs. This arrangement shall be robust such that down loading of meter data during power off condition is not affected and minimum three down loads are guaranteed for a outage. There shall be a suitable backup provision for display in case of super capacitor failure. The performance of the super capacitor shall be verified by removing all the batteries from the circuit in any meter during sample testing or inspection. The charging time of super capacitor shall not be more than 6 hours.

In any case, RTC battery power shall not be used for display under power off condition. Battery used for the meter display during power off condition shall be separate from the battery used for the real time clock.

4.6.1 REAL TIME CLOCK AND BATTERY:

The MD integration cycle shall be on the function of RTC of the meter. The maximum drift in real time clock of the meter shall not exceed plus or minus 7 minutes per year as per CBIP 304 and crystal should be temperature compensated for temperature range of 0 to 50˚C when powered by internal battery or supply. This shall be verified during sample testing and inspection. A non-chargeable lithium battery of adequate storage energy with 10 year guarantee period only should be provided. Necessary document to this effect has to be submitted along with the

tender. If the battery fails within meter warranty period the meter should be replaced by the supplier within 15 days from the date of intimation failing which the entire cost of the meter will be recovered from the balance payment due to the supplier.

4.6.2. The Synchronization of Meter RTC Time/day shall be possible through password / key code enabled command from the CMRI/PC. Battery used for the meter display during power off condition shall be separate from the battery used for the real time clock.

4.6.3. Facility for correcting the drift in Real Time clock through CMRI has to be provided with proper security. Whenever RTC is corrected, all the registers and other parameters shall be updated. The date and time should be user programmable. The meter should be capable of storing in the memory the readings of a specified date and time in a month / two months for the purpose of retrieving the same at a later date without change in the specified timing while correcting the drift. The data stored in the memory shall not be lost or updated when the meter is in power off condition, so that same are retrievable even after lapse of several months. (This is to enable utility to defend their cases legally in case of disputed meters/billing revision.)

4.6.6. NON VOLATILE MEMORY:

The meter should have non volatile memory, so that the registered parameters will not be affected by loss of power. The non volatile memory should have a minimum retention time of 10 years. It is the responsibility of the meter manufacturer to retrieve the data from this memory, in the event of display failure and other defects except for completely burnt meter as and when requested by the purchaser with in a period of 30 days from the date of intimation. The transportation cost for the same should be borne by the supplier.

4.7.0. DISPLAY:

4.7.1. The meter shall have a minimum 6 digit bright liquid crystal display (LCD) which shall be of STN (super twisted pneumatic)/FSTN type, construction suitable for temperature withstand of 80 degree centigrade(storage) and 65 degree for operation, with high contrast . The minimum character shall be 10 mm height and 5mm width (for alphabets it shall be 5 x 3 mm). The LCD display should have wide viewing angle of 45 degree to 60 degree cone up to 1m distance. The display size shall be to accommodate 6 digit of specified size with inter digit gap of 1mm and side gap of 2mm on all four sides. The accuracy of display parameters on LCD display for all parameters shall be matching with the accuracy class of meters as per IS.

4.7.2. For a clear visibility of the display of the meter reading at a distance large viewing area with large display icons is preferred. However, the display size area should not be less than 60x20 mm (1200 sq.mm.).The display should not be affected by electrical & mechanical disturbances.

4.7.3. When the meter is placed in a enclosure at a constant temperature of 65 degree 'C' for a period of 30 minutes the character of LCD should not

deform and also when kept at a constant temp of 80 degree for a period of 30 minutes, the LCD should work satisfactorily when restored at normal temperature. The LCD shall have a minimum life period of 100K hours with operating temperature range of 30-80˚C.

4.7.4. The LCD display of the meter should be permanent backlit.

4.7.5. DISPLAY RESOLUTION:

1. Voltage	=	0.01V
2. Current	=	0.01A
3. Power Factor	=	0.01
4. Active Energy	=	0.1 KWH
5. Apparent Energy	=	0.1 KVAh
6. Demand	=	0.01 KW/KVA

The display for KWH should have facility for high resolution display with minimum 3 decimal digits to facilitate testing with desired accuracy with 30 minutes integration period.

4.8. LED Indications

4.8.1. LEDs shall be provided for following indications :

a) LED for Test output pulse (Imp/KWH) – Red
b) for current reversal – Icon in LCD display
c) LED for external earth – Icon in LCD display
d) Magnetic Tamper – Icon in LCD display.

4.8.2. Except for the test output pulse LED, the other indication can be alternatively provided as Icon on backlit LCD display. LED shall be low power consumption and distinctly visible from distance.

4.8.3. Location of calibration of LED (Preferably at the centre should be such that) the calibration pulses can be sensed easily through the sensor. The above LED shall have minimum intensity of 10 milli-candelas, accessible from the front.

4.8.4. The clearance of calibration LED from any of the sides of window portion shall be approximately 20 mm.

4.8.5. The bidder shall state the necessary number of pulse counts to ensure measurement accuracy of at least $1/10^{th}$ of class of the meter at different test points.

4.9. CONNECTION DIAGRAM:

Every meter shall be indelibly marked with connection diagram showing for which it is intended and shall be attached to the inner side of the extended terminal block cover. In case of any special precautions need to be taken at the time of testing the meter, the same may be indicated, along with the circuit diagram.

4.10. MARKING OF METERS:

4.10.1. Every meter shall have name plate beneath the meter cover window portion such that name plate cannot be accessed without opening the cover. In addition to the details furnished as per CBIP -304 the following details may be incorporated in the meter.

1. Manufacturer's name or trade mark and place of manufacture.
2. Number of phases and number of wires for which the meters is suitable.
3. Serial No. year & month of manufacture.
4. Principle unit in which the meter records.
5. Reference voltage.
6. Current Rating (Ib & I max)
7. Reference frequency in HZ.
8. Meter constant (Imp) KWh)
9. Accuracy Class.
10. Guarantee period.
11. PO. No. and Date.
12. Property of "AP-PDCL"
13. Ultrasonic Welded :
!4. Communication Capability : LPRF

4.10.2. The first five digit of serial No. should be assigned for PO No. (three digit) and issuing year of PO (two digit) and then after a slash mark assign your regular serial No. and it is to be noted that while downloading the meter data the entire Sl. No. should be downloaded (including the first five digits). Stickers in any case shall not be accepted.

4.10.3. The name plate should not get damaged due to atmospheric conditions and the marking shall be indelible, distinct and readable from outside the meter. The nameplate marking should not fade or otherwise be adversely affected by UV exposure with lapse of time. Also the connection diagram of the meter as per CBIP-304 shall be furnished.

4.10.4. It shall be possible to check the accuracy of active energy measurement of the meter on sight by means of LED output. Resolution of the test shall be sufficient to enable the starting current testing less than 10mins. And accuracy test at the lowest load shall be completed with desired accuracy within 5 mins.

4.10.5. All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

4.10.6.The meters shall be designed with application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH technology.

4.10.7.All insulating material used in the construction of meters shall be non-hygroscopic, non-ageing and of tested quality. All parts that are likely

to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

4.10.8.The meter shall conform to the degree of protection IP 51 of IS:12063/IEC:529 for protection against ingress of dust, moisture and vermin.

5.0. MEASURING PARAMETERS:

5.1. ACCURACY REQUIREMENTS:

5.1.1. Clause of accuracy of the Static meters shall be 1.0. The accuracy should not drift with the time and environmental changes (Temperature variations). The percentage error limits shall comply to class 1.0 for all data as per IS.13779/CBIP 304. The reading of meter shall be without any multiplication factor, meters supplied with MF will not be accepted and same will be rejected. The internal least count of energy recording shall not be more than 0.01KWH; hence, every 0.01 KWH/KVAh consumption will be internally stored. Also there be no loss of energy registration on account of power outages due to high start up time of the meter.

5.1.2. To verify the above the meter will be switched off/on 40 times at rated parameters and energy recording on display with decimal digit should be within 0.4 KWH of the energy, it should register, as per its accuracy at that load. This will be verified during testing sample meters and at works during inspection. The meter reading should not be disturbed during sudden switching of heavy loads or transient voltage spikes.

5.1.3 The meter should measure 'kWh' and 'kVARh' continuously. It should compute kVAh in such a fashion that the leading power factor should be ignored i.e. kVAh calculation is based on lag only (For leading loads KVAH=KWH). Also, the meter should compute MD in kVA along with MD in kW for an integration period of 30 minutes. Meter should have some visual indication available on the display to indicate the end of the demand integration period.

5.2. INSTANTANEOUS PARAMETER:

(1) Signed KW,KVar (2) Instantaneous KVA (3) Instantaneous PF (4) Voltage (5) Current (6) Real time clock-date & time.

5.3. BILLING PARAMETERS:

5.3.1. (1) Cumulative KWH (2) Cumulative KVArh(lag & lead) (3) Cumulative KVAh (4) MD in KW/ KVA (5) Average PF (6) Reset date & time (7) MD Reset Count.

5.3.2. The Average power factor for the billing period may be calculated as per IS.14697 of 1999 – Clause 1.3.and G-7.

5.3.3. All the billing parameters like KWH, KVArh(lag & lead), KVah, M.D. in KW and the resetting date & Reset Count for six resettings in 6 calendar months should be available in the memory and on display for two consecutive billing periods.(i.e., for last two resets)

5.3.4. The meter should measure the total energy consisting of 50 Hz energy and harmonic energy.

5.4 MAXIMUM DEMAND INTEGRATION PERIOD (DIP):

DIP shall be set at 30 minutes duration.

DIP shall commence at the fixed time intervals of real time.

MD recording of Block method is to be used.

The rising value of current demand with rising time should be held in the memory in the event of interruption (or) switching off power supply and it should not fall to zero on such instances.

5.5. MD AND POWER FACTOR RESET :

5.5.1. Meter shall continuously monitor and calculate the average maximum demand for each demand integration period of 30 minutes and the maximum of these shall be stored along with date and time, when it occurred.

5.5.2. The meter should have reprogrammable automatic /manual resetting facilities of M.D. If it is automatic reset, MD and Reset should reset on every 30th at 00.00 hrs of every/ alternate calendar month (odd / even (reprogrammable)) and the reset date can be reprogrammable by AP-PDCL. Necessary CMRI software is to be supplied by the meter manufacturers. There should be feasibility to reset the meter through CMRI by authorized person. During reset main energy registers should not get affected during next reset, the billing parameter should be stored in the memory and should be available in display (for last two resets) while pressing push button.

6.0 DISPLAY PARAMETERS

The order of the display should be as follows:

6.1 MODE I : AUTO DISPLAY

1) LCD check.
2) Real time and date.
3) Cumulative KWH,KVARH(lag&lead),KVAH
4) Maximum Demand in KW&KVA since last reset
5) Maximum Demand in KW&KVA for last reset.
6) Instantaneous voltages & signed current (Separate display for V & I)
7) Instantaneous signed power in KW,KVAR and KVA.
8) Date& time of last reset.
9) MD reset count - cumulative.
10) Meter covers open tamper with date & time.

6.2 MODE II : PUSH BUTTON DISPLAY

11) Billing KWH cumulative reading at the time of last reset.
12) Billing KVAh cumulative reading at the time of last reset.
13) Billing Average PF
14) Power OFF hours since last reset billing period.
15) Frequency.
16) Magnetic interference indication.

17) Cumulative MD
18) Cumulative power OFF hours.
19) Cumulative active energy KWH & KVAH for each calendar month for previous six months with programmed billing date.
20) Maximum Demand in KW/KVA up to two decimal for each calendar month for previous six months with date and time of such demand
21) Power OFF hours for the last billing period
22) Tamper data.

6.3 MODE III :

High resolution reading for calibration (KWH, KVAH)

6.4.1. The provision for scrolling the display should be made by either One Push Button or Two Push Buttons with the following provisions :

1. The display time of each parameter in auto mode should be 10 seconds.

2. There shall be no blank display at any time of power availability.

3. In push button mode also auto scroll parameters should be made available in the same order as indicated.

4. The display mode shall be switched to Auto Display Mode, if the scroll button is,

a. Not pressed during the past 1 minute (If in the Push button Mode i.e. MODE-II)

b. Not pressed during the past 30 minutes (If in the High resolution Mode i.e. MODE-III)

5. The display shall be switched on to Push Button Mode by just pressing the scroll button.

6. The display shall be switched on to High Resolution Mode by pressing 10 seconds the scroll button.

7. In the Push Button Mode i.e. Mode-II, Pressing of push button by 5 seconds the display should be switched on to Reverse direction and vice versa for Forward direction.

6.4 THE DISPLAY OF THE ABOVE PARAMETERS SHOULD APPEAR IN THE SAME ORDER AS INDICATED ABOVE.

6.5 TOD TARIFF/DEMAND

The meter should be capable of registering the time-of-day energy (TOD) and maximum demand. The time registers shall be programmable by the purchaser. The meter should have in-built capacity to define up to six registers. The meter should also have capacity to define multiple time zones within the registers. The change of the TOD time-period(s) or defining TOD

registers should be possible through CMRI with special authenticated command from the BCS so that only authorized person(s) can make such changes. The main control of this system along with proper security password/code should be available on one or more computers located at the authorized location(s) as per the directions to be given by the Purchaser.

The meter shall have provision for registering energy, maximum Demand and average PF in two tariff registers (peak and off-peak).

- TOD Timings in six zones by default shall be as given below. However software has to be provided to change the TOD zones whenever required.

  TOD 1 - 00.00Hrs. to 06:00Hrs.
  TOD 2 - 06.00Hrs. to 10:00Hrs.
  TOD 3 - 10.00Hrs. to 14:00Hrs.
  TOD 4 - 14.00Hrs. to 18:00Hrs.
  TOD 5 - 18.00Hrs. to 22:00Hrs.
  TOD 6 - 22.00Hrs. to 24:00Hrs.

This data for the last 12 months shall be downloaded by MRI.

7.0. LOAD SURVEY CAPABILITY:

7.1. The meter should be capable of storing the following parameters with 30 minutes integration period for a period of 60 days in its memory:

a) Cumulative KWH,KVAH & Consumptions at 00.00 hrs on daily basis.
b) Daily KWH & KVAH with 48 integrated values.
c) No supply period and no load period on daily basis in hrs & minutes.
d) Phase wise voltages and currents

7.2. The meter should be capable of storing the above parameters in the memory at 00.00 hrs everyday for a period of 60 days; it shall have provision such that daily readings are available at the end of the each day for the 60 days. The above readings are to be retrieved through CMRI & Lap top (BCS) and viewed in BCS. Provisions should be made such that printout of graph (each parameter in a separate colour) and data on these parameters can be obtained easily as detailed in Annexure-1.

7.3. The said parameters shall be always available as per Annexure – I.

7.4. The load survey data, billing parameters and tamper data shall not be updated when the meter is in power off condition. Whenever the meter is released from service condition either for safe custody or due to billing dispute ,the above said data shall be retained for the period of actual use of meter and shall retrievable as when required.

7.5. Provision for entering the account number in alphanumerical form shall be available at BCS end. In the load survey graph, no supply period, no load period is to be distinguished with cumulative values for each day for the above events.

8.0 COMMUNICATION CAPABILITY :

8.1.1. Communication capability of the meter shall be based on Internal Low
Power Radio Frequency (LPRF) technology and meter shall have wireless Communication with HHT, i. e. Common Meter Reading Instrument (CMRI), for auto – reading and downloading all types of data from the meter.

8.1.2. The interface for communication between MRI & Base computer shall be supplied free of cost. The software required for CMRI and Base Computer System with necessary security provisions shall also be supplied free of cost with the following features:

a. It shall be possible to read the meter via RF from a minimum distance of 60 metres even with obstruction from the meter. However, longer communication range is preferred.

b. 1. In LPR communication, the range is further increased up to MINIMUM 5 hops through mesh networking of installed meters. The time of reading for the next layer of meters may vary and the additional time of +3 sec for each added meter layer i.e. for each hop shall be allowed.

2. The aerial of the radio should be full wave.

c. It should not be possible to reset the energy reading in the meter or make any change in the data stored in the meters either current or historical, with the MRI.

d. The supplied meter and CMRI shall be based on open Protocol for Interoperability of meters of different design and make enabling standardization of all makes of meters with the following settings.

1. The radio device shall have 64 bits addressing as per IEEE.802.15.4 standard.

2. The radio shall program with 16 byte security key (128 bit encryption) The value of the sample = “AP-PDCL”
3. RF module at meter shall be programmed for router AT firmware.
4. The baud rate for radio to meter shall be 9600 bps.
5. The over the air baud rate shall be 50Kbps.
6. Meter serial No. shall be programmed inside the radio and shall be mapped with 64 bit MAC address of the radio.

7. RF Module should have over the air firmware upgrade facility

f. The frequency range of LPRF equipment shall be within the approved frequency band of 865-867 MHz as per G.S.R. 564 (E), dt. 30th July, 2008.

g. The meter shall use licence free frequency band for communication so that licence for use of LPR equipment to read energy meter at site not required.

h. The meters with internal LPRF technology shall have two way communications to read the meter data. However, data could only be downloaded from the meter to CMRI, but no command regarding data alteration in the meter and data retrieval from meter to CMRI shall be possible in any case.

i. The LPR and RS232 Port of the meter shall have no physical access from outside the meter.

J. It shall not be possible to tamper the data stored in meter and CMRI, even after getting the password of the software. It shall be locked at the time of manufacturing. Adequate tamper proofing shall be provided to disallow any change of such auto recorded reading by any means.

k. Meter shall not be accessible at site other than the parameters specified elsewhere in the specification through any kind of communication for any alteration in the Factory Settings. Tamper proof arrangement shall be made to get such a reading even at the time of power failure.

l. Necessary up gradation facility for the provision of DCU (Data Concentration Unit) at a later date should also be incorporated so that to implement AMR in future.

m. There should not be any degradation or interference on internal circuitry of meter because of LPR module.

8.1.3. It shall be the responsibility of meter supplier to reprogram and upgrade MRIs supplied by them with other suppliers' protocol free of cost for a minimum period of 5 years and keep enough spare code memory and RAM in the supplied MRIs for this purpose.

8.1.4. Parameters to be downloaded through LPR to CMRI :

a) Meter Make & Sl.No.
b) Meter Capacity
c) Date & Time
d) Cumulative Energy (KWH,KVARH & KVAH)&MD
e) Phase wise voltages and currents
g) Tamper counts since last download

8.1.5. The meter should have a properly secured RS232 port in front of the meter with DLMS open protocol for data transfer without error to or from CMRI/BCS/LAPTOP. The communication port shall have proper sealing arrangements. The meter reading software should be capable of data transferring in respect of all the stored data.

8.2. The supplier should provide meter reading protocols at free of cost the I/O Mapping or Suitable software like API with documentation at free of cost, which will help a third party agency / service provider to read any make of meter remotely. This shall be applicable only if the Indian standard was not ready or non-availability of certification facility with NABL accredited government institutions in India during the time of issuing P.O.

8.3. The protocol used in the meter shall have to be provided at the time of supply for the purpose of AMR System. Past suppliers shall have to submit a written undertaking that they will provide protocol for meters supplied so for, the said undertaking shall be submitted along with offer failing which, the offer will be rejected. They will also ensure that protocol for the type of meters supplied in the past will be provided as & when supplies are affected. It shall be responsibility of the meter manufacturer to provide required software and all the facilities free of cost to enable the use of optical port for reading and retrieving the data from the meter through CMRI and to download the data to PC. Necessary upgrades of software shall be supplied free of cost for downloading simultaneously the existing parameters and any parameters added in future specifications of meters.

8.4. All important data such as billing, & tamper should be stored in NVM and same should not be possible to change/tamper these data through any standard serial communication. This will be verified by removing the NVM of the meter and check the working of the meter during sample testing or inspection.

8.5. Common Meter Reading Instrument (CMRI)

a. The CMRI shall posses a specific Serial No. which cannot be changed.

b. The CMRI shall be supplied free of cost in the ratio of one for each 500 Nos. of meters with two optical probes of minimum 1 meter length along with battery charger, user manual, batteries and a set of direct communication cords of 1 meter length for data downloading to the Laptop or PC for each CMRI.

c. The CMRI shall be capable to download following data individually after respective command to CMRI.

(I) Only billing data,
(ii) Only Tamper data,
(iii) All data.

d. CMRI shall be capable of downloading billing data of at least 4,000 (Four thousand) meters at a time. The CMRI supplied shall be

capable for downloading data of multiple designs and make of meters as well as for meters added in next 5 years for the common communication protocol attached herewith.

e. For downloading the data from meter, meter ID shall be manufacturers' serial no. of meter. No separate command for entering meter serial no. in CMRI shall be necessary.

f. After successful downloading of meter data to CMRI, an indication on both, CMRI and meter for confirmation of successful data transfer shall be provided for each set of data, viz. billing & tamper data.

During this period, the energy recording shall not be affected. Repeated downloading from the same meter shall be disabled for a minimum period of 30 minutes for each set of data, viz. billing, load survey & tamper data. For example, if only the Billing Data is downloaded, then further downloading of Billing Data shall be disabled for further 30 minutes.

g. After downloading the data from meters, it shall be possible to create a single file for all records. The contents of this file shall not be editable.

h. Further, there shall be facility in CMRI to provide the transfer of data to base computer through USB port.

i. The interface for communication between CMRI & Base computer shall be supplied free of cost. Two nos. of chords of minimum length of 1 mtr. shall be provided with each CMRI for downloading the data from CMRI to base computer.

j. Necessary software conforming to the enclosed communication protocol, required for CMRI and Base Computer System with necessary security provisions shall also be supplied free of cost.

k. The manufacturer / supplier shall modify the compatibility of CMRI with the meter and the base computer system due to any change in language or any other reasons at their own cost.

l. The CMRI shall have facility for re-entering the meter serial numbers directly from base computer system so that once these meters are read and the data is uploaded on base computer system, the serial numbers of existing meters could be deleted from the CMRI and the meter serial numbers of other meters can be entered in the CMRI. CMRI shall not download the data of the meters whose serial no. is not in CMRI.

m. The CMRI shall be with "search" facility based on either serial number of meter, consumer number, Date of Transfer.

n. The CMRI shall indicate the status of total consumers / meters, number of consumers / meters read and balance consumers

/ meters. The search facility for the balance meters shall be provided on the CMRI.

o. The data downloading time (from meter to MRI) through LPR shall not exceed 5 sec for each meter (with +2 sec. max tolerance time). The time of reading for the next layer of meters may vary and the additional time of +3 sec. for each added meter layer i.e. for each hop shall be allowed.

p. In future without any modification, the communication software shall be capable to transfer the billing data and meter serial number required for automatic Spot Billing Machine to automatically generate the energy consumption bills at consumer premises without any human intervention after the data is collected by the MRI. The MRI shall continuously transmit the data until an acknowledgement is received from the SBM (Spot Billing Machine). The manufacturer shall provide the protocol and other information to interpret the transmitted billing data. The data storage inside the MRI and communication of MRI with the meter shall be encrypted so that there is no possibility of tampering with the downloaded data.

q. Meter manufacturers must submit the protocols between RF to RF of two LPR's i.e. frequency, communication baud rate & encrypted code etc. Access must be transparent as because meter data will be downloaded through third party LPR as per standard of IEEE 802.15.4.

r. The CMRI supplied should be capable of taking reading for 3 Phase LPRF meters also.

The downloaded data along with date and time stamp of such reading shall remain on CMRI with suitable encryption and it should not be possible to pre-program or manipulate the recorded data on the CMRI before downloading the same to SBM and base computer. The Supplier shall provide the software (compatible with Windows) and necessary field training to the billing agency at free of cost.

Confirmation shall be provided on CMRI after successful printing of the bill in SBM.

The CMRI shall possess battery back up of 8 hrs of continuous data transfer and shall be capable of storing data for at least 4000 nos. meters at one time.

The CMRI shall indicate the status of % of memory utilized and number of meters read.

It shall be responsibility of the meter manufacturer to provide the required software and all the facilities and support required by the purchaser, to use the CMRI for reading and retrieving the data from the meter and to download the data to SBM/Base Computer on free of cost basis.

8.2. All important data such as billing, & tamper should be stored in NVM and same should not be possible to change/tamper these data through any standard serial communication. This will be verified by removing the NVM of the meter and check the working of the meter during sample testing or inspection.

9.0. SOFTWARE:

9.1.1. Meter manufacturer shall provide the BCS software which should be compatible GUI (Graphical User Interface) facility with Windows platform and suitable software compatible to CMRI for reading the data from the meters.

9.1.2. The computer software shall be user friendly. The data transfer shall be highly reliable and fraud proof (No editing shall be possible on base computer by any means).The software shall have capability to convert all the data into ASCII format All the options available in BCS are to be displayed in the window screen.

9.1.3. The software to be installed in the CMRI/PC for the purpose of reading and programming the specific make(s) of static meters shall be made available by each meter manufacturer whose meters are to interface with CMRI/PC.

9.1.4. The Software should have polling feature with optional selection of parameters to be downloaded. The Software should have programmable facility to restrict the access to the information recorded at different security levels.

9.1.5. If the software supplied is of latest version than the earlier one supplied, then the same shall be such that it is compatible for the meters already supplied and also the meter data already read and available at BCS to the extent possible. Confirmation to this effect shall be furnished along with the offer.

9.2.0. The meter manufacturer should provide software for CMRI, BCS as detailed below:

9.2.1. The CMRI software should have the following provisions

a) Collection of data (All Data including dumped).
b) Download to BCS.
c) Billing.
d) Load Survey.
e) Tamper.
f) Setting.
g) Name plate (Meter Sr.No, Meter type, Rating, Meter constant and Manufacturing month & year.).
h) Upload from BCS.
i) Clear CMRI (through CMRI&BCS).
j) Instant parameters.
k) Accuracy Test.
l) Memory Check (to view available data capacity & balance space in terms of Number of meters)

9.2.2. Programming parameters (through CMRI)

a) Demand Integration period.
b) MD type (KW/ KVA).
c) MD Reset.
d) Real Time Clock, Date & Time(Time & date correction for fast and slow).
e) Profile Capture period (24hrs-minimum, 90days-maximum).
f) Reset date and time (Odd/Even billing months).
g) Time between two successive data retrieval through LPR.

9.2.3. The meter reading /BCS software should be capable of transferring data without load survey shall be within 2 minutes and including load survey & the entire meter data from meter to CMRI within (5Mins). The data transfer (from meter to CMRI /AMR equipment) rate should be minimum 9600 bps.

9.2.4. The software shall have provision to indicate no. of Meters data available in CMRI.

9.2.5. Provisions must be there to limit the load survey data in terms of days when data is being collected by CMRI from the meter i.e. it shall not be a dumped data for 90 days.

9.2.6. The Software shall have time stamp provision whenever downloading of data from Meter.

9.2.7. The Name Plate details shall be made available whenever downloading is made from the meter i.e., Meter Sr.No, Meter type, Rating, Meter constant and Manufacturing date.

9.2.8. At any instant of time during communication with CMRI the display should not get disturbed and a suitable indication shall be made available in the Meter display/CMRI that communication has been established with CMRI.

9.2.9. The calibration software (CMRI) should have testing time of minimum15 minutes and the parameters KWH/ KVAh calibrated simultaneously. The start and stop command for calibration shall be instantaneous without any time delay.

9.2.10. The consumption energy and duration of test between start and stop should be displayed in Common Meter Reading Instruments.

9.2.11. The CMRI software should be compatible to display the instant parameters phase wise voltage, current (With icon for Direction), signed KW & signed PF to conduct power check. During the calibration period it should not be possible for the CMRI to go to power saver/ switch off mode.

9.2.12. Facility for converting the billing data in the CMRI to ASCII format or any other format specified by the purchaser is to be provided by the manufacturer within 30 days from the date of intimation.

9.3.0. The meter manufacturer should provide software for CMRI, BCS when downloaded through LPR as detailed below:

9.3.1. The CMRI software should have the following provisions

a) Collection of data (All Data including dumped).
   i) Specific Meter Wise
   ii) Scanning for Meters
   iii) Schedule Wise.
b) Download to BCS.
c) Billing.
d) Name plate (Meter Sr.No, Meter type, Rating, and Manufacturing month & year.).
e) Instant parameters.
f) Memory Check (to view available data capacity & balance space in term of Number of Meters)
g) Tamper
h) Accuracy check.

9.4. The BCS software should have the following provisions

9.4.1. Collection of data from CMRI and Meter

a) Dump Data (All Data).
b) Billing data.
c) Load Survey.
d) Tamper.
e) Setting.
f) Name plate (Meter Sr.No, Meter type, Rating, Meter constant and Manufacturing date.)
g) Clear CMRI.
h) Instant parameters.
i) Accuracy Test (on BCS/Laptop).
j) Uploaded File size display (bytes capacity).

9.4.2. Programming parameters

1) Demand Integration period.
2) MD type (KW) Block method.
3) MD Reset.
4) Real Time Clock, Date & Time.
5) Profile Capture period (24hrs-minimum, 90days-maximum).
6) Reset date and time.
7) MD reset type Auto/Manual

9.4.3 The BCS software should be capable of transferring data including load survey & the entire meter data from meter/CMRI within 5 Minutes

9.4.4. a) The BCS software shall have search facility to access / view

Data as per CMRI Id (alpha numeric),
Meter Serial no.
Consumer ID.
Date of meter reading
Uploaded data based on weekly and monthly collection
Section wise meters (with assigned code)

Data of a specific meter related to a specific period by entering from and to dates.

b) The BCS software should have facility to indicate the status of RTC and NVM.

9.4.5. In the collected data, one of the meter data is to be transferred to some other file if necessary such provision shall be made available. In the downloaded data consumer details is to be provided as optional.

9.4.6. The facility to have Backup data for future reference in a separate storing device, the data in BCS shall be compressed in suitable form for transfer and shall be extracted to view/use the same in future as and when required. This provision shall be made available in the software and demonstrated during inspection/installation. (Similar to zip file format)

9.4.7. The BCS software shall have the facility to display multiple graphs for meter reading uploaded for different period for comparison/ analysis while displaying the load survey graph, the exact value for the particular period shall be displayed with respect to the co-ordinates selected. X & Y axis is to be clearly defined and scaled for easy viewing.

9.4.8. The viewing/printing format has to be provided as per the format given in Annexure – I. Alternate formats will not be accepted without prior approval. The printing of formats shall have multiple printing options like paper size, portrait/landscape, etc.

9.4.9. The software shall have data export facility to spread sheet format like MS-Excel /Open office without distortion stored of data.

9.4.10. The software shall have facility to analyze data acquired from at least two meters database simultaneously.

9.4.11. The software shall be capable of opening at least two sessions simultaneously so that one session shall access one meter / CMRI and another session shall analyze data uploaded from another meter.

9.4.12. The data already available in the BCS should not be overwritten by new data whenever the same is uploaded.

9.4.13. As and when the vendor releases new or latest or advanced versions of Meter Hardware/Firmware / Software, the same should be made available to AP-PDCL immediately by default on the release date free of cost. The latest versions should support all existing hardware/meters in the field supplied in this tender and earlier supplies if feasible.

9.4.14. The above software shall be given with security arrangements and compatible for CMRI, BCS.

9.4.15. The successful tenderer should supply necessary software suitable to Common Meter Reading Instrument and BCS for testing along with samples. All the data including load survey to be provided with print along with selection option and print setting option The date and time in BCS is in the form of DD/MM/YY & Time: HH/MM.

9.4.16. Meter manufacturer shall provide API / Exe file with documentation for downloading the data from the meter along with the sample meter.

9.4.17.Checksum logic shall also be provided for the downloaded data along with the sample meter.

9.4.18.Checksum checking Exe / API shall also be given for validating downloaded meter data as well as generated XML file with sample meter.

9.4.19.It shall be possible to upload the CMRI data to any PC having CMRI software. A consumer based data uploading facility is required so that CMRI shall upload data only in that PC which has the concerned consumers' data. The consumer number + meter number + make code shall be the key for creating consumers' files or overwriting consumers' files in PC.

9.4.20.The BCS software shall create one single file for the uploaded data, e.g. if CMRI contains the meter readings of 1,000 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. Also there shall be a provision to give filenames while creating the file.

9.4.21.The downloaded data along with date and time stamp of such reading shall remain on MRI with suitable encryption and it shall not be possible to pre-program or manipulate the recorded data on the MRI before downloading the same with Serial No. of MRI on computer.

9.5 **Data Security** : The meter manufacturer are responsible for ensuring that the data extracted from the meters using algorithms in the software/firmware of the meters up to down loading to the BCS Software remains secure during the process. Any repairs and recalibration to the meters should be done only at the factory of the meter manufacturers.

10.0. TAMPER AND FRAUD PROTECTION/MONITORING:

10.1. The meter should have tamper and fraud protection features so as to continue to register active and apparent energy accurately under the following conditions:-

Current Reversal: The meter energy consumption correctly in forward direction irrespective of the direction of current in current circuit. The

reverse indication in the form of blinking LCD phase Icon / LED to indicate the phase reversal.
Phase current reversal events and abnormal capacitor current due to imbalance and faulty capacitor units shall not be recorded as phase current reversal.

The meter should have tamper & fraud protection features and shall record selected tamper information with date & time stamp. Along with the tamper information, the meter shall also record the instantaneous values of voltages, currents and power factors to simulate and elaborate the existing condition during the tamper events.

The tamper information shall be available along with date & time of occurrence and restoration of the event and phase indication.

The meter shall to continue to register active energy accurately even under following conditions:

1. The meter should register energy consumption correctly in forward direction irrespective of the direction of current in the current circuit (i.e. main and load wire interchange).

1.1 The meter should continue to record energy even when
(a) Any two phases are disconnected i.e. in presence of any one phase and neutral. Under this condition the meter should record correctly.
(b) One phase and neutral are disconnected i.e. in presence of any two phases and the load is drawn through local earth. Under this condition, earth load LED indication shall appear on meter and the maximum limit of error allowed is ±3% from the reference condition.
(c) When incoming neutral and outgoing neutral is disconnected,
(d) The meter should record energy accurately irrespective of the phase sequence of supply

CT open/CT shorting/by-passing:
In case of CT open or bypass/shorting, which may result in the current imbalance between the phases, the tamper indication should appear by means of measuring neutral current. Meter shall store the date & time of occurrence and restoration in the non-volatile memory.

a) The meter shall continue to record energy as per prevailing condition even if the neutral is accidentally or incidentally disconnected.

b) The Meter recording should be insensitive to passage of DC voltage or should log as an event in the memory as neutral disturbance. The meter should record energy as per voltage measured between incoming phase and neutral when DC signal/voltage is injected on the neutral through a diode/device. A conformity test on this condition will be carried out at Vref applied between incoming phase and diode terminal.

c) The meter shall be immune of any abnormal frequency signal or meter shall log and display as tamper in the event abnormal frequency signal i.e., less than 47.5 Hz or more than 52.5 Hz is supplied to the meter.

d) Meter shall record energy accurately under the effect of signals emitted by mobile phone or any other such devices. In conformity of this, the meter shall be checked under such influence (10 minutes) for the following conditions: 10% Ib and UPF, 50% Ib and UPF, Ib and 0.8 PF, 120% Ib and UPF.

e) The meters shall be immune to tampering through application of external magnetic fields at least up to 0.5 Tesla (DC) and 0.2 Tesla +/- 5% (AC) as per CBIP-304. The magnetic test should be conducted. On application of magnetic interference beyond 0.27 Tesla, the meter shall record energy at 150% Imax, rated voltage and UPF as per CBIP. The meter is expected to be immune to such interference and this clause is applicable when interference level is beyond immunity offered by the meter. The vendor has to state the level under which meter records energy as stated above.

f) Even if 440 V is applied between the phase & neutral of the meter for 30 minutes, the meter should not get damaged and continue to record correctly with in Class 1 accuracy after restoration of normal supply.

g) The accuracy of the meter Real time clock disturb, Memory data corruption, meter functioning hang up etc. should not occur with the application of abnormal voltage/frequency generating device such as spark discharge of approximately of 35KV.The meter shall be tested by feeding the output after exposing it to the following conditions for 10 minutes:

- On any one of the phase or neutral terminals
- On any connecting wires of the meter.
- Voltage discharge with 0-10mm spark gap
- at any place in load circuit
- at proximity of the meter(within 5 cm)

10.2. To this effect, a test certificate must be submitted by the bidder from any government NABL LAB/CPRI. The accuracy of the meter shall be checked before and after the application of the above device.

10.3. One of the above tests will be conducted on the samples supplied along with the bids by the purchaser in his lab; if the meter fails the offer will not be considered for evaluation.

Note 1 : The disturbances to be considered are

(1) Harmonics.
(2) Voltage dips and short interruptions.
(3) Conducted transients.
(4) D.C. and A.C. magnetic fields.
(5) Electro Magnetic fields.
(6) Electro static discharge.
(7) Radio frequency interference suppression.

Note 2 : Especially , special care should have been taken such that DC & AC magnetic field in proximity of the meter do not damage or influence the meter performance. Besides, an internal magnetic shield has to be provided in the meters in this regard.

10.4. TAMPER.

10.4.1. Tamper and fraud monitoring should be as per CBIP-304.

10.4.2. The tamper indications should be selected and stored in the order of occurrence as per clause 10.4.4.

10.4.3. Generally the meter shall have the following special features to monitor/ detect tamper and fraud against meter:

a) Meter Cover: In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same should be recorded as tamper event with date & time stamping and the meter should continuously display that the cover has been tampered. It is suggested that the manufacturer should develop their software such that there will be some time delay for activation of this tamper feature and during that period only the meter cover should be fitted. The delay in activation of software shall be for one instance only. After the meter cover is fitted, it shall get activated immediately without any delay on LCD display in blinking mode so that it is easily noticed by the meter reader. The above tamper shall detectable even in power off condition.

b) Magnetic Tamper: The meter should record energy with in specified limit as per CBIP-304 latest amendments in presence of stray magnetic field and record the influence of abnormal magnetic field with date and time in the memory.

10.4.4. The No. of tamper information / events for each type of tamper to be recorded under each category is as follows:

1. Current reversal (50)
2. CT open/CT shorting/by-passing(100)
3. PT missing
4. Software (settings and parameters) change – (20) events with date and time along with parameter changed.
5. Cover opening (5).
6. Magnetic influence events (10)
7. Power failure (85)

10.4.5. A minimum of 200 tamper information (FIFO basis) shall be available in the memory for retrieval from the meter at any time. The above tamper in EACH information is of First In First Out basis but the first tamper occurrence with date should appear till the tamper persist.

10.5. Tamper Information:

10.5.1. After occurrence of any tamper, the tamper display should appear in the display and the tamper data should remain in memory so that the occurrence of latest tamper can be retrieved and also seen in the display at any time.

10.5.2. Provisions should not be there to clear the tamper information through CMRI or any other means. Provisions should be made such that first occurrence of tamper should exist as long as tamper exist in the circuit.

10.5.3. The persistence time for detecting any abnormality shall be 35 minutes for occurrence and for restoration; it shall be 3 minutes be except for meter cover opening.

10.5.4. In BCS the snap shot feature is to be provided for every meter tamper data with cumulative KWH, Kvah, V, I & Date & time at the time of the tamper occurrence & tamper restoration. A summary report on tamper events along with its total duration for each type of the events occurred from the date of manufacturing or installation is to be made available as detailed in Annexure-1.

10.5.5. The Bidders should furnish the details as to how their meter is able to detect/ protect / recording the above tamper and fraud features with sketches and phasor diagram. Bids without these details, shall be treated as Non responsive and rejected.

11.0. SELF DIAGNOSTIC FEATURE:

The meter shall have indications for unsatisfactory / non functioning of the following:

(i) Time and Calendar.
(ii) Real Time Clock (RTC) Battery in meter reading printout at BCS end.
(iii) All display segments.
(iv) Non volatile Memory status in meter reading printout at BCS end.
(v) Internal Backup battery/ Super Capacitor Status

12.0. RESPONSIBILITY:

12.1. The meter software suitable to Common Meter Reading Instruments shall be provided with ordered meters to Common M.R.I. manufacturer approved by Board as detailed in CBIP 304 and as detailed elsewhere in the specification.

12.3. A detailed list of bought out items which are used in the manufacturing of the meter should be furnished indicating the name of firms from whom these items are procured is to be submitted along with the technical bid.

12.4. The meter shall be completely factory sealed except the terminal block cover. The provision shall be made on the Meter for only two seals to

be put by utility user. The Terminal cover should be transparent with one side hinge with sealing arrangement.

12.5. AP-PDCL is procuring large quantity of meters. As such bidder have to depute Hardware Engineers and Software Engineers on call basis, who should 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 MRT Engineers(Dist) without any additional charge. The list of Engineers available for the above service shall be furnished along with the bid.

13.0. Type Tests:

13.1. The type test certificates for all tests as per IS: 13779-1999/ Relevant IEC Standard (latest amendments) and CBIP 304 will be furnished along with tender. Type test certificates from any one of the NABL accredited Govt.laboratories alone SHALL be considered.

13.2. Type test certificates shall not be more than 3 years old from the date of bid opening.

13.3. Additional type test

13.3.1. In addition to the test mentioned in 13.1. above, the supplier shall have to furnish the following type test reports:

a) Test of voltage variation as per this specification.
b) Compliance of anti-tamper features as per this specification.
c) The meter shall withstand impulse voltage test at the rated impulse voltage of 10 kV as per IEC 62052-11:2003

13.3.2. The type test certificates of the above additional tests shall also be submitted before opening of price bid or otherwise price bid will not be opened. The following information should be clearly mentioned in the type test reports.

i) Type of display
ii) Details of Shunts/CT used in main neutral circuit
iii) Accuracy at different leads and PF.

14.0 Acceptance Test:

14.1. All acceptance tests as laid down in the ISS/IEC and this specification shall be carried out at the time of inspection while accepting the meters when offered.

14.2. Following Tests shall also be carried out as Acceptance tests at the time of inspection on agreed samples while accepting the meters by adopting methods specified in IS: 13779/IS: 9000/ IEC standard / CBIP 304 .

a) AC Voltage Test.
b) Test of Meters Constant
c) Test of limits of Error, as per IEC.

The meters shall be tested on automatic test bench of minimum 0.05-0.1 class accuracy duly calibrated in NABL accredited lab with valid calibration certificate.

d) Vibration Test.

e) Shock Test
(Vibration & Shock test shall be carried out as acceptance test by adopting procedure laid down in IS: 12010/19901 and its latest amendment)

f) Voltage variation test as per this specification

g) Test of no load condition at 70% and 120% of rated voltage. The minimum test period shall be as per cl- 8.3.2 of IEC: 62053-21-2003.

h) Test of DC components in AC circuits – The limits of variation in percentage error shall be 3.0% for class 1 meter at Imax/sq.root of 2 and UPF as per IS:13779.

i) Diode injection test.

j) Accuracy test under the anti tamper conditions as per cl-10.0.

k) Test for least count.

l) Test for time taken for down loading data to CMRI & to BCS.

m) Test on communication capability & software compliance.

n) Verification of tamper logics and verification of display parameters.

o) Permanent magnet test.

p) Test of application of abnormal voltage/frequency generating devices as per this specification.

q) Additional acceptance tests shall include Surge withstand (SWC), Lightning impulse and HF disturbance as per IEC 62052-11. For these specific tests, one sample meter per order from one of the offered lot shall be subjected to SWC/other semi-destructive tests. Meters after tests shall not be used.

r) Meter should also be immune for tamper by application of remote loop induction device (jammer).

When meter is subjected to approx. 35 KV abnormal high voltage/ frequency burst and remote loop induction device (jammer), it should not hang and in case if it hang once it should remain hanged permanently.

s) LPRF communication connectivity test as per clause 8.00

15.0. ROUTINE TESTS:

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

16.0. PRE DESPATCH INSPECTION

All Acceptance tests and inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of 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 AP-PDCL's representative / Engineer attending the above testing will carry out testing on suitable number of meters 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 meters shall be sealed after inspection at works as per direction of the inspecting officer. A soft copy of the sealing report in excel format shall be handed over to the purchaser before despatch of the meters.

17.0. SAMPLE:

17.1 Bid Samples:

1. 7 Nos. sample meters for each rating shall be submitted along with the bid. The internal potential link of the sample meters shall be kept open and provide 1 No. company seal to meter cover. Tenders received without samples are liable for rejection. The samples shall be type tested as per CBIP 304 and/or IS:13779/1999 applicable. The sample shall comply with the specification. The testing charges should be borne by the supplier.

2. Test reports for verification of tamper & fraud protection features, Accuracy test for abnormal high frequency and high voltage of 35 KV spark discharge and DC immunity test for each phase circuits to be furnished along with samples.

17.2. The sample meter shall comply with all tests in all respect to this specification. In case sample meters are found not conforming to the requirements both in hardware and soft ware, the price bid of the offer shall not be opened and offer will be rejected.

17.3. Apart from the above a team of officers will also be deputed to the factory premises of the bidder to assess the manufacturing quality and facility and to pick up two more samples of the same range/similar specification from the manufacturing line or from the storage place for testing at Govt accredited labs at bidder's cost before or after placing order. In case sample meters are found not conforming to the requirements both in hardware and soft ware, the purchase order will be cancelled and the vendor will be black listed.

17.4. The time required for down loading the data as confirmed by the bidder will also be tested at CPRI.

17.5. After six months of installations of the meters of the successful bidders, meters at random in premises of consumers, will be released and taken out for testing in CPRI at the cost of AP-PDCL. The bidder's representative can also be present at the time of release and testing of meters. If the meters are found to be defective such supplies will be closed, B.G invoked and EMD forfeited. The firm will not be eligible for participating for any tender in AP-PDCL for the next three years.

19.0 TECHNICAL SPECIFICATION OF NON PUSH FIT TYPE PP METER BOX MADE OF POLYCARBONATE.

i. The box shall be weather proof made out of transparent Polycarbonate with flame retardant properties.

ii. It shall be capable of withstanding temperatures of boiling water for 5 minutes continuously without distortion or softening. The thickness of the box shall not be less than 3mm on the load bearing side (ie., back side of the box) and other sides, door and roof shall not be less than 2.5mm. The box shall have its roof tapering down to both sides for easy flow of water.

iii. The Boxes shall generally comply with the provisions of IS 14722 and IEC60 695. The boxes shall be suitable for outdoor/indoor application. The outdoor box shall have its roof designed for easy flow of rain water without any stagnation on the box. The box shall be with good workmanship.

iv. The dimensions of the box shall be such that there is a minimum clearance of 50 mm on all sides, 25mm clearance on the front and 10mm on the back of the meter then the meter is fixed in the box.

v. Soft rubber gaskets shall be provided all around wherever required for protection against entry of dust and water. It shall comply with IP-33.

a) Colour : Fully transparent
b) The contents of the box are as follows

vi Internal hinges : A minimum of 2 nos. internal hinges well protected against corrosion shall be provided. The hinges of the door should be concealed and they shall be fixed to the flanges provided to the base and cover of the box in such a manner that the door opens by a minimum of 120 degrees.

vii Handle : Suitable handle or knob shall be provided for opening of the box door.

viii Fixing arrangement : The meter base supports inside the box are raised by about 10 mm in the box for ease of wiring. While fixing the meter screws should not protrude outside. For fixing the box to wall or wooden board 4 nos. key holes of minimum 6 mm dia shall be provided at the four corners of the meter box. The meter is to be installed in the box and the box in the assembled condition shall have provision to fix it to a pole or on wall.

xix Latch : The door shall be provided with a GI latch or a 'U' clamp to secure it with the base of the box.

x Sealing arrangement : The box shall have provision for minimum 2 nos. seals to make it fully tamper resistant.

xi Inlet Outlet: Suitable circular holes shall be provided on the left of the box for inlet/right side of the box for outlet with brass or fire resistance high grade engineering plastic glands securely fixed to the box on both sides by check nuts. The incoming and outgoing cables shall be clamped to the inside base of the meter box to ensure fixing of the cable. Cable glands shall be collapsible type so that there shall be no gap after tightening.

Xii Printing : Metallic lable containing the letters "AP-PDCL-and the P.O. No. and date shall be engraved on the top cover of the box. The name of the manufacture shall be engraved on the bottom half of the box. A blank sticker shall also be fixed on the meter box for use of field staff to indicate Service No. etc.

xiii The fixing arrangements shall not be complex and it shall be easily approachable for connections when the door is open and is completely tamper resistant once it is sealed.

xiv The dimensional drawing giving details of meter box shall be enclosed in the bid.

I Guaranteed technical particulars:

The guaranteed technical particulars as detailed in the specification Annexure-I & II shall be guaranteed and a statement of guaranteed technical particulars shall be furnished in the format along with the bid without which the Bid will be treated as Non-Responsive.

II Tests for boxes:

The following tests are to be conducted on the box at any independent accredited laboratory and test reports are to be furnished along with tender schedule. Manufacturing shall be started after approval of test reports and drawings.

i) Test of material identification.
ii) Test for mechanical strength as per IS 14772.
iii) Test for water absorption as per IS 14772.
iv) Test for stability at high temperature as per IS 14772.
i) Test for withstanding temperature boiling water for 5 minutes continuously for non-distortion or softening of material as per IS 14772.
ii) Glow wire test as per CBIP 304.

19.0. PACKING:

19.1. The meters shall be suitably shock proof packed in order to avoid damage or disturbance during transit or handling. Each meter shall be packed in superior quality three ply corrugated cardboard or thermocol

packing box. Such single cartons shall be additionally packed in five ply corrugated cardboard boxes with one copy of manual for easy transportation, storage & handling. The lid of the carton may be suitably sealed. The packing cases may be marked to indicate the fragile nature of the contents.

19.2. Damaged meter received at the designated stores shall be replaced within 15 days from the date of intimation, failing which the payment for the delivered lot will not released.

20.0. DRAWING AND TECHNICAL LEAFLETS:

20.1. Detailed dimensional drawing along with the circuit diagram and detailed leaflets with incorporation of GTP of that particular PO and showing clearly the quality of the material for meters and its constructional features should be furnished along with the supplies to the consignees.

20.2. The meters shall be supplied with a proper manual which includes details of recoding principle, display parameters, tamper logics, BCS software particulars, safety rules and installation practices as per this specification. The generic form of vendor manual will not be accepted, for non compliance of this 2% of the meter cost will be deducted from the balance payment during P.O closure.

21.0. GENERAL:

21.1. In addition to specific requirements furnished in the preceding paragraphs, all other stipulations and requirements are as per relevant clauses in the standards indicated in this specification shall be complied.

21.2. All the annexure/schedules of this specification are forms part of this document and bidders shall comply with requirements indicated in them.

21.3. The components specified in the annexure with specified makes against each item alone will be accepted.

21.4. One soft copy of all the documents enclosed in the technical bid shall be submitted along with the offer in the same cover.

21.5. The schedule of GTP, Deviations and List of components with make are mandatory requirements to be submitted along with the technical bid.

22.0 Guarantee:

The material should be guaranteed for satisfactory operation for a period of 5 years from the date of receipt of material at destination stores by the consignee in good condition. During the guarantee period if the meter while in its normal operation is found defective, it shall be replaced by the supplier with a new meter free of cost with in 15 days. If the meter is not replaced within 30 days of intimation the supplier should note that the guarantee period would be extended to that extent by the number of days delayed beyond 30 days. If the tenderer does not replace within 180 days the cost of the meter(s) will

be recovered from the existing bills/ future bills/ Bank Guarantees available with AP-PDCL.

If the failure after erection and commissioning at site is more than 5% the AP-PDCL reserves the right to cancel the balance quantity of the order or take such suitable action as deemed fit including legal proceedings.. Minor defects like broken glass during transit etc., may be permitted to attend to in Stores /MRT Labs.

For the purpose of ensuring 5 years guarantee the manufacturer may provide his seal to the meter at the manufacturer's premises and dispatch in sealed condition after inspection by AP-PDCL's representative.

22.1 Replacement of defective meters

The meters declared defective by the consignees (including meter battery failures) and/or by meter testing lab shall be replaced by the supplier up to the full satisfaction of the purchaser at the cost of supplier within one month of intimation by purchaser/stores officer.

23.0 Quality Assurance Plan :

A) The bidder shall invariably furnish the following information alongwith his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

i) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates :

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and list of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards.

These limitation shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offers.
ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.
iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.

The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following :

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorise work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.

i) The structure of the organization :

- The duties and responsibilities assigned to staff ensuring quality of work.
- The system for purchasing taking delivery and verification of material.
- The system for ensuring quality workmanship.
- The system for retention of records.
- The arrangements for contractor are internal auditing.
- A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii) Quality Plans :

- An outline of the proposed work and programme sequence.
- The structure of the contractor's organization for the contract.

- The duties and responsibilities assigned to staff ensuring quality of work.
- Hold and notification points.
- Submission of engineering documents required by the specification.
- The inspection of materials and components on receipt.
- Reference to the contractor's work procedures appropriate to each activity.
- Inspection during fabrication/ construction.
- Final inspection and test.

ANNEXURE – I

GUARANTEED TECHNICAL PARTICULARS

SR.NO	GTP PARAMETERS	BIDDER'S CONFIRMATION
1.	MAKE & TYPE	
2.	APPLICABLE STANDARD IS 13779/1999 (AMENDED UP TO DATE) (YES/NO)	
3.	ACCURACY CLASS 1.0 (YES/NO)	
4.	RATED VOLTAGE = 3X240 V (+20% TO -40%)(YES/NO)	
5.	BASIC CURRENT (Ib) 5Amps (YES/NO)	
6.	MAXIMUM CONTINUOUS CURRENT(Imax) 600% Ib (YES/NO)	
7.	STARTING CURRENT 0.2 % OF Ib (YES/NO)	
8.	SHORT TIME OVER CURRENT 30 Imax(YES/NO)	
9.	DISPLAY PROVIDED WITH CONTINUOUS BACKELIT LCD TYPE (YES/NO)	
10.	SIX NUMBER OF DIGITS (YES/NO)	
11.	SIZE OF DIGITS 10X5 MM MINIMUM (YES/ NO)	
12.	POWER CONSUMPTION OF VOLTAGE CIRCUIT 1.5W, 8VA (YES/NO)	
13.	POWER CONSUMPTION OF CURRENT CIRCUIT With CT - 1VA (YES/NO)	
14.	KVA/ KW MD PROVIDED (YES/ NO)	
15.	INTEGRATION PERIOD OF MD 30/ 15 MIN. (YES/ NO)	
16.	TYPE OF COMMUNICATION PORT (RS 232 & LPR) - (YES/NO)	
17.	MATERIAL OF BASE AND COVER POLYCARBONATE AND METER BASE OF ORANGE IN COLOUR (YES/NO)	
18.	ALL ANTI-TAMPER FEATURES AS PER TENDER SPEC., ARE PROVIDED (YES/NO)	
19.	TYPE OF BACKUP POWER PROVIDED,SUPERCAPACITOR (YES/ NO)	
20.	FOR INTERNAL BATTERY/ SUPER CAPACITOR ACTIVATION PUSH BUTTON IS PROVIDED. (YES/ NO)	
21.	PROVISION OF MD RESET (AUTO) WITH EVEN/ODD MONTH RESET DATE AND TIME (YES/NO)	
22.	EXTENDED TRANSPARENT TERMINAL BLOCK COVER (50MM) IS PROVIDED WITH LOGO & SEALING ARRANGEMENT (YES/NO)	
23.	GUARANTEE OF FIVE YEARS FROM date of receipt at stores(YES/NO)	
24.	INTERNAL DIAMETER OF TERMINAL HOLES (mm)	
25.	IN-HOUSE TESTING FACILITIES FOR CONDUCTING ACCEPTANCE TESTS AS PER IEC AND THIS SPECIFICATION (YES/NO)	
26.	AVAILABILITY OF CALIBRATED RSS METER OF CLASS 0.05-0.1 ACCURACY WITH VALID CALIBRATION CERTIFICATE (YES/NO)	
27.	DATA RETENTION FOR A LONG PERIOD UNDER POWER OFF CONDITION. (YES/NO)	
28.	THREE DECIMAL RESOLUTION IN CALIBRATION MODE. (YES/NO)	
29.	LED/ICON FOR CURRNT REVERSAL.(YES/NO)	
30.	FIXING ARRANGEMENT OF METERS AS PER SPEC.(YES/NO)	
31.	FURNISH PRINCIPLE OF OPERATION OF METER OUTLINING THE METHODS AND STAGES OF COMPUTATIONS OF VARIOUS	

PARAMETERS STARTING FROM INPUT VOLTAGE AND CURRENT SIGNALS INCLUDING SAMPLING RATE IF APPLICABLE.(AS A DOCUMENT HARD&SOFT COPY) (Y/N)

32. MANUFACTURING ACTIVITIES AS PER specification SUBMITTED (YES/NO) (DETAILS SHALL BE SUBMITTED SEPARATELY IN SEALED COVER ALONG WITH THE OFFER)
33. FREQUENCY ADOPTED FOR LPRF COMMUNICATION (865-867 MHz)
34. UNDER TAKING FURNISHED AS PER CLAUSE 16.1. (7) OF TECHNICAL SPECIFICATION (YES/NO)
35. RTC TEMPERATURE COMPENSATED 0-50˚C (Y/N)
36. FACILITY FOR CORRECTING RTC DRIFT THRO CMRI/REMOTE (YES/NO)
37. RTC MAKE & ACCURACY (MINUTES/YEAR)
38. PCB IS MANUFACTURED BY SMT AND WITHOUT ANY WIRE LOOPS AND JOINTS (YES/NO)
39. INTERNAL BATTERY GUARANTEE/UNDERTAKING IS SUBMITTED (YES/NO)
40. WHETHER VOLTAGE & CURRENT CIRCUIT ARE SOLIDLY CONNECTED INSIDE THE METER BODY WITHOUT ANY LINKS (Yes/No)
41. WHETHER TYPE TEST REPORTS, MANUAL ALONG WITH COPY OF THE SAME IN TWO CD'S IS SUBMITTED (YES/ NO)
42. SAMPLE METERS AS PER TENDER DOCUMENTS ARE SUBMITTED OUT OF THESE ONE SAMPLES SHOULD BE WITHOUT ULTRASONIC WELDING TO CONFIRM CONSTRUCTIONAL FEATURES OF THE METERS (YES/ NO)
43. AS PER TECHNICAL SPECIFICATION SPARK DISCHARGE TEST AT 35 KV IS CARRIED OUT (YES/ NO)
44. AS PER TECHNICAL SPECIFICATION LEAST COUNT TEST IS CARRIED OUT (YES/NO)
45. DETAILS OF CT/ SHUNT PROVIDED (YES/NO)
46. NUMBER OF PULSES/KWH & KVAHR COUNT.(P.U)
47. TIME TAKEN TO FUNCTION UPON POWERING UP OF METER
48. DETAILS OF TERMINAL BLOCKS PROVIDED (YES/NO)
    a.) GLOW WIRE TEST OF POLYCARBONATE IS CARRIED OUT (YES/NO)
49. MEMORY CAPACITY IN MB.
50. NON VOLATILE RETENTION TIME IN ABSENCE OF POWER.
51. OVER ALL DIMENSIONS & WEIGHT.
52. SEALING PROVISION FOR COVER, TERMINAL COVER, COMMUNICATION PORT(YES/NO)
53. PROTECTION FROM LIGHTNING & HV SURGE (YES/NO)
54. RANGE FOR SAFE OPERATION.
55. TOTAL NUMBER OF TAMPER EVENTS AVAILABLE.
56. CMRI/BCS SOFTWARE AS PER SPECIFICATION (YES/NO)
57. CMRI AS PER SPECIFICATION.
58. CMRI ALONG WITH BATTERY CHARGER SUPPLIED (YES/NO)
59. AVAILABILITY OF SELF DIAGONSITIC FEATURES (YES/NO)
60. VALUE UPTO WHICH METER CAN WITHSTAND DIRECT CURRENT IN AC CIRCUITS WITH OUT GETTING CT SATURATED RESULTING IN MEASUREMENT ERROR OF MORE THAN PERMISBLE LIMIT.

61. MAGNETIC IMMUNITY LEVEL FOR AC/DC
62. COMPLIANCE TO PROTECTION FROM TAMPER & FRAUD. (YES/NO)
63. WHETHER THE METER CAN RECORD ENERGY AS PER VOLTAGE MEASURED BETWEEN INCOMING PHASE & NEUTRAL TERMINAL WHEN DC SIGNAL IS INJECTED ON NEUTRAL TERMINAL THROUGH A DIODE-(YES/NO)
64. AVAILABILITY OF SMT MANUFACTURING AT THE WORKS (YES/NO)
65. AVAILABILITY OF IN-HOUSE DESIGN, DEVELOPMENT & MANUFACTURING FACILITIES (YES/NO)
66. PCB MATERIAL GLASS FR-4 GRADE (YES/NO), IF NO FURNISH DETAILS.
67. SHORT TIME OVER CURRENT WITHSTANDS CAPACITY FOR ONE HALF CYCLES AT REFERENCE FREQUENCY-(IN TERMS OF I-MAX.)
68. DISPLAY SEQUENCE AS PER SPECIFICATION (YES/NO)
69. READING PROVIDED IN THE METER IS DIRECT (YES/NO)
70. CONFIRMATION TO THE EFFECT THAT METER DOES NOT GET DAMAGED EVEN IF 500V (AC) IS APPLIED FOR 5 MINUTES BETWEEN PHASE AND NEUTRAL AND CONITNUE TO RECORD CORRECTLY AFTER RESTORATION OF NORMAL SUPPLY.(YES/NO)
71. CAN METER PERFORM WITHIN CLASS 1.0 ACCURACY UPTO 600% Ib FOR PF RANGE 0.5 LAG, 0.8LEAD & UNITY. (YES/NO)
72. WHETHER METER CAN RECORD ENERGY IF VOLTAGE FALLS UPTO 50% OF RATED VOLTAGE AT Ib TO Imax. (YES/NO)
73. POWER CONSUMED FOR DISPLAY DURING POWER OFF CONDITION (W)
74. DEGREE OF PROTECTION IP-51 (Y/N)
75. DATA TRANSFER TIME
    a. METER TO CMRI (MIN).
    b. CMRI TO BCS (MIN).

ANNEXURE – II
TECHNICAL PARTICULARS OF BOX

Sl. No.	**Characteristics**	
I. 1.	Manufacturer's name	
2.	Material used for box body	
3.	Material withstanding temperature	
4.	Dimensions of box (lxwxh)	
5.	Thickness (mm)	
II. 1.	Color	
2.	No. of Hinges	
3.	Handle provision	
4.	Sealing Arrangements	
5.	Inlet & Outlets	
6.	Gasket a) Whether gasket is provided for door b) Material of the gasket	
36.	Suitable for outdoor installation	

All the materials and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes like given as under so as to ensure higher reliability and sustained accuracy.

1. Current Transformers :

The Meters should be with the current transformers as measuring elements. The current transformer should withstand for the clauses under 5&9 of IS- 13779 /1999 The current transformer should 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 should be with the Surface mount type along with the ASICs.

USA	:	Teridian, Anolog Devices, Cyrus Logic, Atmel, Philips Dallas, ST, Texas Instruments, Renesas
Germany	:	Siemens
South Africa	:	SAMES
Japan	:	NEC
Taiwan	:	Prolific Technology

3. Memory chips :

The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges. Meter shall have non volatile memory (NVM). No other type of memory shall be used for data recording and programming. (The life of the NVM is highest) There shall be security isolation between metering circuit, communication circuit, and power circuit.

USA	:	Teridian, Atmel, National Semiconductors, Texas Instruments, Philips, ST, Renesas, Microchip.
Japan	:	Hitachi
Germany	:	Siemens
Taiwan	:	Prolific Technology

4. Display modules :

a) The display modules should be well protected from the external UV radiations.

b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for Viewing angle). c)The construction of the modules should be such that the displayed quantity should not disturbed with the life of display .d) It should be transreflective HtN or STN type industrial grade with extended temperature range.

Hongkong	:	Genda
Singapore	:	Bonafied Technologies,Holtek,Haijing.
Korea	:	Advantek
Japan	:	Hitachi,Sony.
Taiwan	:	Prolific Technology

5 . Communication Modules :

Communication modules should be compatible for LPRF with optical port for communication with meter reading instruments.

USA	:	National Semiconductors HP, Optonica,Agillant,Texas Instruments,Maxim.
Holland / Korea	:	Phillips
Japan	:	Hitachi
Taiwan	:	Ligitek, Prolofic Technology

6 . Optical port- Optical port should be used to transfer the meter data to meter reading instrument.

The mechanical construction of the port should be such to facilitate the data transfer easily.

USA	:	National Semiconductors HP, TI.
Holland / Korea	:	Phillips
Japan	:	Hitachi
Taiwan	:	Ligitek,Everlight,Prolofic Technology
Germany	:	Osram,Siemens

7 . Power supply :

The power supply should be with the Capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections. It should not also be affected by magnet -SMPS Type.

8. Electronic Components :

The active & passive components should be of the surface mount type are to be handled & soldered by the state of art assembly processes.

USA	:	National Semiconductors, Atmel, Philips, Texas Instruments, BC Component, Fairchild.
Japan	:	Hitachi, Taiyo Yuden, Oki, Toshiba, AVZ or Ricon
Korea	:	Samsung
Japan	:	Panasonic, Toshiba, Fairchild, PEC, CTR
Germany	:	Vishay, Epcos & NSC, Yageo
Taiwan	:	Prolific Technology

9. Mechanical parts :

a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.

b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.

10. Battery :

Maintenance free Lithium battery of long life of 10 years. Only non rechargeable battery should be used for RTC as well as display in absence of Power, since the life & Reliability of these are better than the rechargeable batteries.

Makes

USA	:	Maxell,Varta,Tedirun, Sanyo or National
Japan	:	Panasonic,Sony , Mitsubishi,Sanyo
France	:	Saft
Korea	:	Tekcell.
Taiwan	:	Prolific Technology

11. RTC & Micro-controller-The accuracy of RTC shall be as per relevant IEC / IS standards.

USA	:	ST,Teridian,Philips, Dallas,Atmel, Motorola,Microchip, Texas Instruments,Holtek,IDT,Renesas.
Japan	:	NEC or Oki,Epson.
Malaysia	:	Intersil.
Taiwan	:	Prolific Technology

12. P.C.B.:

Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm if 2 layer and 1.2 mm if 4 layer or more.

Japan	:	Hitachi, Taiyo Yuden, Oki, Toshiba, AVZ or Ricon Panasonic, Fairchild, PEC, CTR
Korea	:	Samsung
Germany	:	Vishay, Epcos & NSC,Yageo
Taiwan	:	Prolific Technology