Specification for AC Whole Current

Smart Energy Meter

Prepaid and Postpaid

Single Phase Smart Energy meter

with

DLMS Compliancy

AND

Prepaid/Post Paid Feature

Technical Specifications for DLMS complied A.C. Single Phase , 2 Wire Solid State (Static) Fully Electronic Prepaid as well as Post paid Smart Energy Meter, Accuracy Class: 1.0 , Current Rating (5-30) A, With Backlit LCD Display for 240 V System with DCU/Router & Repeater.

1.0 SCOPE

a) This specification covers design, engineering, manufacture, testing as per format submitted with offer for inspection and supply of A.C. Single phase, two wire solid state (static) fully electronic DLMS complaint, with Prepaid & Post Paid feature, energy meters of accuracy class 1.0 and current rating (5-30) A, with backlit LCD display for 240 Volt systems as per requirement in this specification. The meter should be capable of recording and displaying energy in KWH and demand in KW for single phase two wire A.C. loads respectively for power factor range of Zero lag – unity – Zero lead. Meters should have facility/ capability of recording tamper information with Remote Firmware Upgradation.

b) It is not the intent to specify completely herein all the details of the design and construction of meter. However the meter shall conform in all respects to high standards of engineering, design and workmanship shall be capable of performing commercial operation continuously in a manner acceptable to PURCHASER, who will interpret the meanings of drawings and specification and shall have the right to reject any work or material which in its judgment is not in accordance therewith. The offered meter shall be complete with all components, accessories necessary for their effective and trouble free operation of the system for the purpose mentioned above. Such components shall be deemed to be within the scope of bidders supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

c) The AMI Implementing Agency (AIA) shall quote against this Tender. The AIA may be a Meter Manufacturer or a Communication provider or a IT based organisation. It is mandatory that in case of all manufacturers, the offered meter shall be ISI marked and bidder shall have to furnish valid BIS certification along with the offer. The meter manufacturer may co-opt communicating and proprietary HES agency as their consortium partner or the Communicating agency / HES agency may co-opt the other two as their consortium partner. All the terms and conditions will be imposed upon the Bidder. No responsibility of consortium partner of the bidder will be entertained by PURCHASER.

2.0 STANDARDS APPLICABLE

Unless specified elsewhere in this specification, the performance & testing of the meters should conform to the following Indian/International standards, to be read with up to date and latest amendments/revisions thereof as on 90 days prior to floating of tender.

Sl. No.	Standard No.	Title
1	IS 13779, 1999 read with its latest amendments	Specification of AC Static Watt hour meters class 1.0 and 2.0
2	IS 15959:2011 with latest amendment no 3.	Data exchange for electricity Meter reading, Tariff and Load Control – Indian Companion Specification Category C3 meters.
3	CBIP Report No.325 read with latest amendments.	Specification for AC Static Electrical Energy Meters
4	IS 12346 (1988)	Specification for testing equipment for A.C. Static Electrical Energy Meter (latest amendment).
5	C.E.A. Regulation No. 502 / 70 / CEA / DP&D dt 17/03/2006	Central Electricity Authority (Installation and Operation of Meters) Regulation, 2006.
6	IS 14434 (1998)	Polycarbonate Moulding and Extrusion Materials.
7	IS-15884	AC circuit connected Static Smart prepaid Meters for Active Energy (Class 1 and Class 2)
8	IS-16444	A.C. Static direct connected watthour smart meter

3.0 CLIMATIC CONDITION

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions.

i) Maximum Ambient Air Temperature in shade: 55 Degree C
ii) Minimum Ambient Air Temperature: (-) 10 Degree C.
iii) Maximum Relative Humidity : 95% (non-condensing)
iv) Minimum Relative Humidity: 10%
v) Height above mean sea level: Up to 3000 meters
vi) Average number of tropical monsoon per annum: 5 months
vii) Annual Rainfall : 100 mm to 1500 mm

4.0 SUPPLY SYSTEM

System	1 Phase 2 Wire
Rated voltage (Vref)	240 V – Phase to Neutral
Rated Current	Basic current:- 5 Amps (lb), Maximum current:- 30 Amps (l max)
Rated Frequency	50 Hz

5.0 POWER FACTOR RANGE

The meter should be suitable for full power factor range from zero (lagging) through to Unity to zero (leading).

6.0 POWER SUPPLY VARIATION

The meter should be suitable for working with following supply system variations.

System	1 Phase 2 Wire
Specified range of operation	70% to 120% of reference Voltage i.e. 240 Volt.
Frequency	50Hz +5%

7.0 ACCURACY

7.1 Class of accuracy of the meter should be 1.0. The accuracy should not drift with time.

7.2 Maximum error limit at 1% Ib, UPF should be within +/- 2%.

7.3 For voltage variation use of “between 70% to 50%”of Vref. allowable error limit is +/- 4%.

8.0 POWER CONSUMPTION

8.1 Voltage Circuit:

The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency should not exceed *1.0 Watt and 4 VA* respectively (as per existing WBSEDCL requirement.

8.2 Current Circuit:

The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 1 VA (as per existing WBSEDCL requirement.

For Prepayment meters Voltage and Current Circuit Power Consumption shall be as per IS15884.

9.0 STARTING CURRENT & RUNNING AT NO LOAD

The meter should start registering energy at 0.2 % of basic current at unity power factor and first pulse must be appeared within 10 minutes (i.e. time between two consecutive pulses).Running at no load: When 70%Vref and 120%Vref voltage is applied and no current flows in the current circuit, the test output of the meter should not produce more than one pulse.

10.0 MAXIMUM CONTINUOUS CURRENT

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification. The same is indicated in table in clause 4 above.

11.0 GENERAL & CONSTRUCTIONAL REQUIREMENTS

11.1 Meters should be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured.

a) Personal safety against electric shock.
b) Personal safety against effects of excessive temperature.
c) Protection against spread of fire.
d) Protection against penetration of solid objects, dust & water.

11.2 The meter should be designed with ASIC (application specific integrated Circuit) and should be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH (Pin through hole) technology.

11.3 The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent, for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it should not be black in colour. The meter casing should not change in shape, colour, size, and dimensions when subjected to 200 hrs on UV test as per ASTMD 53. It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75. For testing of changing colour72 hrs on UV test is applicable. The meter cover should be sealable to the meter base with at least 2(two) nos. seals.

11.4 The meter should be supplied with a transparent extended terminal block cover (ETBC). The ETBC should not be easily detachable from the base and be secured to the base using a hinge/ without hinge arrangement. ETBC should be closed at the bottom to prevent access for wires to terminal holes, but should have a slot of size 20mm X 20 mm(at least 375sq mm) on extreme right hand side of the bottom of the terminal cover The terminal block should be made of high grade non-hygroscopic, fire retardant, fire resistant and glass reinforced poly-carbonate with terminal holes of minimum diameter 5.5mm and should be suitable to accommodate the insulation of the conductors, meeting the requirement of IS 13779 / CBIP technical report-325 (As this is the latest CBIP Guidelines). The minimum centre to centre distance between adjacent terminals should be 13 mm. Terminal cover should have provision for sealing with at least one seal. The embedded portion of the sealing arrangement, i.e. the arrangement to hold the sealing screw for terminal cover should be such that the same cannot be uprooted in any case without breaking/damaging the terminal block. The bidder shall submit relevant documents regarding the procurement of polycarbonate material. The polycarbonate material of the following manufacturers only shall be used:

a) G.E. Plastics/SABIC LEXAN 943A, or equivalent like 123R for Top cover & Terminal cover/ LEXAN 503R or equivalent like 143R for base & Terminal Block.

b) BAYER - Grade corresponding to above

c) DOW Chemicals- - DO –

d) MITSUBISHI- - DO –

e) TEJIN- - DO –

f) DUPONT- - DO -

11.5 All insulating material used in the construction of meters should be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion should be effectively protected against corrosion during operating life by providing suitable protective coating.11.6 The meter should conform to the degree of protection minimum IP 51 for protection against ingress of dust, moisture and vermin.

11.7 The meter should be capable of providing phase to neutral protection up to 433 V for 1(one) hours.

11.8 The manner of fixing the cables to the terminal block should ensure adequate and durable contact such that there is no risk of loosening or undue heating. Meter should have 2 (two) screws in each terminal for effective clamping of cables. The screws shall not have pointed ends at the end of the thread. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter should be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections should be so designed that contact pressure is not transmitted through insulating material. All terminals and connecting screws and washers should preferably be of tinned / nickel plated brass material. The terminals and all connecting screws will be of suitable material capable of withstanding a current of 150% of Imax for two hours, continuously.

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

11.10 The meter should have fixing holes, at least one at top and two at bottom. The top hole should be such that the holding screw is not accessible after fixing the meters. The lower fixing screws should be provided under the sealable terminal cover.

11.11 The meter should be fitted with SHUNT for measuring current in the phase element. The Neutral element may have either C.T. or SHUNT or HALL EFFECT SENSOR with proper isolation. The shunts, used in current circuit must be of high quality having high thermal stability and temperature co-efficient. The shunts should be E-Beam / Spot welded. In case of Hall Effect Sensor, meter should record as per requirement of technical specification in normal and tamper conditions and life of battery used for recording and display during single wire operation as per clause 12 (IX) should be guaranteed for 10 years.

11.12 The meter cover should be permanently fixed to the meter base by using

ultra sonic welding or any other technology which is either equally or more efficacious in such a way that the meter cover can't be opened without breaking the same, i.e. the meter should be break-to-open type. In case any attempt is made to separate the meter cover from the base by using any tools / implements / device, there should be visible evidence of tampering or attempt to open. The bidder will have to specify the type of technology used by him and will also indicate the tests / standard required for testing the same along with test certificates. However, sealing with commonly available adhesives will not be accepted.

11.13 Meter should have a permanent indication in its display as well as logging of tamper in case of removal of top cover, even in power off condition and it should not disappear even if cover is re-fitted. It should be treated as non roll over event .

11.14 Sealing Arrangement: The sealing screws used for the meter cover shall be fixed upside down so that these are tightened from the rear or screw less design for fixing the base and cover but provision for sealing arrangement must be there. A run through screw (stud) has to be provided from bottom side & sealing is to be done on the top side of the meter. Two independent sealing screws are to be provided at each sides of the meter casing. The sealing screws shall be Tinned Brass or Nickel Plated Steel/Brass. In addition to the sealing screws provided to the meter cover, the sealing screws of the terminal cover should also be Tinned Brass or Nickel plated steel. Meters must be supplied with two no manufactures' seal between meter base and cover at both sides. If lock /click fit integrated seals are used during sample Meter, after through checking acceptance of said seal will be decided.

12.0 ANTI-TAMPER FEATURES

The meter should have the following anti-tamper features and should record and register forward energy accurately under the following conditions :Reverse power indication LED should be provided or indication should be in display circuit whenever applicable. In any case, meter should record energy accurately, taking the values of Phase current and Neutral current into account, whichever is higher.

i) Input phase and neutral connections are interchanged.
ii) Incoming mains is connected to outgoing terminals and load is connected to incoming terminals.

iii) Any combination as permissible in all four connecting points should not affect the accuracy of the meter

iv) Load return is connected to a local earth and not returned to the meter as well as the phase and neutral at supply side are reversed.

v) Occurrence of combination of `(ii) and (iv) 'or (iii)'and (iv)'

vi) A part of the load is returned to a local earth and the other part is returned to the meter. "Earth load indication" should appear in display with logging of tamper, if difference between phase current and neutral current lies more than 6%. Test will be done through actual load. In this case allowable limit will be within ± 2% w.r.t. Master Meter.

vii) Meter should record energy with maximum error of (+) 6% to (-) 4% on Injection of DC (+) ve & DC (-) ve in neutral having magnitude up to *600 V (as 535 to 580 volt is the output voltage of the device)* & injection of chopped AC in neutral& injection of pulsating D.C. in meter neutral. Tests in this respect will be conducted by using a device available with us for chopped AC injection (60V to 300V) & steady DC injection & Pulsating DC injection set. Steady DC voltage will be rectified from a three phase power supply. Single phase Circuit diagram of the device enclosed with the tender documents.

viii) Meter should record energy with maximum error of ± 4% even in absence of neutral / Phase wire not connected at incoming & outgoing, i.e. single wire operation. In such condition Meter should start recording energy at 1.0 Amps. However, meters, which are immune or maintain better accuracy, will be preferred. Both elements should record energy under single wire mode if same phase is given in both elements and total load is driven through earth.

ix) The meter should be either immune to Electro Static Discharge or sparks of 35 KVp approximately generated from automobile ignition coil and high frequency Jammer. Tests in this respect will be conducted by using commonly available devices and during spark discharge test, spark will be applied directly at all vulnerable points of the meter for a period of 10 to 20 minutes and meter should record ±4 % w.r.t. Master Meter under this condition. After application of spark discharge meter should record correctly within the specified limits of errors. Beyond 35 KVp meter should record as tamper if not immune. It should record the event under Indian Event Reference of others type with Event ID's 249 for Occurrence and 250 for Restoration with OBIS (0.0.99.98.4.255). Other details are applicable as per "Others Tamper Profile of IS 15959.

N.B.: Threshold Values of all above occurrence and restoration of tampers are showing in annexure – V. Meters should offer compliance to requirements of CBIP-325 and its amendments for tampering using external magnets. The meter should be immune to tamper using external magnets. The meters should be immune to 0.2T of A.C. magnetic fields and 0.2 T of D.C. magnetic fields, beyond which it should record as tamper if not immune. Meter should record Imax with the application of 0.5T permanent magnet with logging in BCS, if not immune. MINIMUM LAST POWER ON 60 DAYS LOAD SURVEY with IP 30 min (IN KWH, VOLTAGE & AMP) MUST BE AVAILABLE IN BCS *in graphical as well as tabular representation*.
The meter should offer a link less design i.e. there should be no isolation link provided between the current and voltage circuits and hence there would not be any possibility of tampering with the same. The meter should be capable of recording the following tamper events in memory (minimum 200 events, occurrence & restoration are considered separate event) with date and time stamp preferably along with snapshots of V, I, PF and Kwh. The logging will be on FIFO basis.

- Current reversal
- Power failure
- Neutral Disturbance
- Single wire
- Magnetic Tamper

Generally unique identifier is assigned in the Event reference Tables 49 to 53, if any doubt contact with testing dept. of WBSEDCL.

13.0 DISPLAY

13.1 Display of Meter Serial No:

Meter should have provision for displaying either Meter Serial No of 9 complete digit (First 2 digit provided for Alpha and last 7 digit provided for Numerical values) or Meter serial number should displayed in Billboard fashion "Separate Scrolling Mode" to accommodate 9 digit Alpha – Numeric Meter Serial No. In this case Meter Serial number should remove from Auto & Push Button Display.

13.2 The measured value(s) should be displayed on a Liquid Crystal display (LCD) register. The height X width of the digit should be minimum 7.5 X4.0 mm. Higher square area also acceptable. The KWh energy registration should take place with at least 6 complete digits. No decimal is accepted for

main KWh & KVAh register. The display should have backlit capability for easy reading from2meters. When the LCD is placed at a constant temperature of 65 degree C for a period of 30 minutes in operating condition and 80 degree C for 30 mins. Under de-energized / storage condition, it should not get deformed. The LCD should be of TN (Twisted Pneumatic) type with display size area of at least 40 X 15 mm. The display should have wide viewing angle of at least 70 deg. Dot Matrix type LCD will not be acceptable. Display should have viewing angle 35 degree up and down from eye level.

13.3 The data should be stored in non-volatile memory (NVM). The non-volatile memory should retain data for a period of not less than 10 years under un-powered condition. Battery back-up memory will not be considered as NVM.

13.4 The register should be able to record and display starting from zero, for a minimum of *1500 hours (as per in IS 13779 and CBIP 325),* the energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.

13.5 In addition to provide serial number of the meter on the display plate, the meter serial number should also be programmed into meter memory for identification through communication port for CMRI / Laptop / meter reading print out.

13.6 It should be possible to read the meter during power off condition. It should also be possible to read the meter with CMRI / Laptop in this condition. If battery is used for the same, it should be a separate battery and not the one used for RTC, i.e., the RTC battery and the battery used for display during power off condition should not be the same. The battery should be of high quality Lithium / Lithium – ion battery, with life of at least 10 years. In case of Lithium battery, no. of operations per day are to be restricted to maximum 5(five) operations so that battery life is not hampered during ten years.

14.0 DISPLAY SEQUENCE:

The meter should display the required parameters in two different modes as per the sequence given below.

A) Auto Display Mode
B) Push Button Mode

A) Auto Display Mode:

1. *LCD Test*
2. Meter serial no

3. Real Time
4. Date
5. Credit Balance in INR
6. Present load cost in Rs/Kwh
7.Cumulative Active Forwarded Energy (KWH)
8. Cumulative Reactive Forwarded Energy (KVARH lag)
9. Cumulative Reactive Forwarded Energy (KVARH lead)

B) Push Button Mode:

1. *LCD Test*
2. Meter serial no
3. Real Time
4. Date
5. Cumulative Active forwarded energy in kWh.
6. Cumulative Reactive forwarded energy (Lag) in kVarh
7. Cumulative Reactive forwarded energy (Lead) in kVarh
8. Cumulative Apparent forwarded energy in kVAh.
9. Last Bill Maximum demand (kW) & KVA with date and time.
10. Billing period counts
11. Total tamper count.
12. Last Bill Active Forward energy in kWh.
13. Last Bill Apparent energy in kVAh.
14. Instantaneous Load (KW/KVA)
15. Instantaneous voltage.
16. Instantaneous Phase Current.
17. Instantaneous Neutral Current
18. Maximum demand kW and KVA for Current month with date & time.
19. Supply Frequency
20. TOD Energy in KWh.
21. Instantaneous Power Factor.
22. NIC card status.

The meter should also be capable of offering a high resolution display which should enable conducting of dial testing by the user in the shortest possible time and as a minimum, the meter should be capable of offering a resolution of 4 digits after decimal & 2 digits before decimal for the high resolution KWh display or 2 digits after decimal and 4 digits before decimal for the high resolution Wh display. Any other useful display will be

acceptable. Accuracy test for low load will be measured by short dial test as well as pulse count test.

Engineering Display Mode:

This display shall be available only upon the application of valid codes on the meter, and shall enable the display of the following:

1. *Software version*
2. *All the limiting parameters value such as load limit, current limit & emergency credit limit.*
3. *Switch operation counts*

15.0 MAXIMUM DEMAND REGISTRATION AND RESET

Meter should continuously monitor and calculate the average maximum demand for each demand interval time of 30 minutes and maximum of these in a calendar month should be stored along with date and time when it occurred. The maximum demand should automatically reset at 24:00 hrs. of the last date or 00:00 hrs. of the first date of each calendar month and the corresponding value along with date/time stamp shall be transferred to Billing (History) registers. The integration period should be set as 30 minutes, on real-time basis. The billing purpose parameters (active forwarded energy, maximum demand in kW) should be recorded and should be available in Bill (History) for a minimum period of last 12 months in BCS. By default the M.D. reset will be at preset date and time i.e. in this case at the 1st day of each calendar month at 00:00 hrs

16.0 TIME OF USE / TIME OF DAY MONITORING:

The meter should offer the capability of time of use monitoring for energy.The meter should have facilities to record Active, Apparent Energies and **Apparent MD** in at least 8 zones. At present TOD timings will be programmable in three zones as follows:

TOD – 1	06:00 Hrs to 17:00 Hrs,
TOD – 2	17:00 Hrs to 23:00 Hrs,
TOD – 3	23:00 Hrs to 06:00 Hrs of next day.

8 no TOD Energy registers should be visible in display as well as BCS end **(Desirable condition for future upgradation of meter)**

Register are fixed (3 or 8 Nos) but In case of any change of TOD timing in future as per directive of SERC, the same is to be incorporated by the supplier even after completion of the order as per instruction from the appropriate authority. *The TOD timings must be programmable and it can be possible to*

change the time slot / period for TOD recordings through authenticated BCS using Laptop, MRI and transferring vend codes through HES. Necessary software for the same is to be provided by the bidder.

In BCS TOD parameters are KWh,KVAh, KW and KVA.

17.0 SELF- DIAGNOSTIC FEATURE

The meter should be capable of performing complete self diagnostic check to monitor integrity of data memory location at all time. The meter should have indication for unsatisfactory / nonfunctioning / malfunctioning of the following:

a) Time and date on meter display
b) All display segments on meter display
c) Real Time Clock (RTC) status in meter reading prints out at BCS end.
d) Non-volatile Memory (NVM) status in meter reading prints out at BCS end.
e) Synchronisation of time of meter & HES clock from MDAS instantly for less than 3 minute and through HES for more than 3 minute with alarm at HES.

18.0 COMMUNICATION PORTS AND PROTOCOL:

The meter should have a galvanically isolated optical communication port for data communication with CMRI / Laptop. No extra port is required. The port should be compatible with IEC 1107. The main communication protocol of the meter will be through RF/RF with NIC card. The RF module will communicate in 865-867 MHz free license Band certified from WPC, Ministry of Communication, GOI.

19.0 CMRI / LAPTOP / BCS REQUIREMENTS:

The Common Meter Reading Instrument (CMRI / Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI / Laptop. The BCS should be WIN 7/8/10 pro based and copy righted. The data stored in the meters memory should be available on the BCS. This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, and history data should be

convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI / Laptop software. The supported parameters must be downloaded from the meter itself. This functionality must be implemented in sing le software, no separate executable will be used for different types of meters which supports DLMS. Mapping of OBIS code as per DLMS protocol for instantaneous / billing / event / transaction parameters will be checked through third party DLMS conformity testing tool. Test for automated Meter reading will be conducted by downloading Meter data through Modem at our system through third party software also. The bidder has to supply also the Meter Reading protocol and API (if required) free of cost. The protocol should not be complicated & should be easily understandable to introduce compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies. The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost. BCS supplied by the manufacturer should be compatible with meters to be supplied against this tender as well as with previous supplied meters. Optical Port of manufacturer cord should have either magnetic locking or Click slip (latch) fitting. It should not be possible to change/alter date and time in the meter by sending commands from the CMRI or directly through Laptop. For alteration of RTC time, MD resetting, change of TOD timing, it should be possible to be done only through authenticated commands from BCS after scheduling of CMRI/Laptop for a particular meter at the time of reading the meter. No alternation/change on the above points should be possible through authenticated commands from BCS without scheduling of CMRI/Laptop for meters. Moreover, no alternation/change should be possible using CMRI only, i.e. the control has to be with the BCS.

Billing parameters (KWH, KVAH, MD in KW & KVA, TOD wise KWH, Average P.F, and Average L.F).

If any OBIS code is not available for single phase then consider the OBIS code of three phase meter and for current use red phase current OBIS code. Only one BCS should be provided for programming and reading.

20.0 DISPLAY POWER UP IN ABSENCE OF MAINS SUPPLY

The meter should have the provision of providing the display of billing parameters (Auto Display) in absence of main supply. Press of push button should activate the display to facilitate hands free meter reading with auto-off provision. Meter may be Power on after 2 years, battery backup Power must be stable on that condition. Battery for RTC should not be less than 350mAh (±10%). It should be possible to read the meter using CMRI / PC during power-off condition using this facility. Battery for downloading and Display power up purpose should not be less than 650 mAh (±10%) and it should be chargeable. The meter must be capable of down loading data either through optical port or from HES during Power Off condition.

21.0 MARKING OF THE METER

The marking on the meter should be in accordance with relevant clauses of IS 13779. Colour of the Name Plate will be Light Grey. The basic marking on the meter nameplate should be as follows (all other markings as per IS 15959A2_R1 clause E - 10.1 should also be there):

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (imp/kwh)
k) Class index of meter
l) "Property of WBSEDCL"
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 5 1/2 Yrs. from the date of delivery)
o) BIS marking
p) Place of manufacture
q) Bar coded Serial no. of the meter along with manufacturing year & month.
r) DLMS Category Marking "C3"
s) Right and Left LED Nomenclature

22.0 CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter should be clearly shown on terminal cover.

23.0 OUTPUT DEVICE

The meter should have a test output accessible from the front and capable of being monitored with suitable testing equipment while in operation at site. The test output device should be provided in the form of LED output. There should be adequate clearance of the test output from other outputs so that there is no interference of other outputs while performing accuracy test with standard scanners. The relation between test output and the indication on display should comply with the marking on the name plate (imp per KWh). Two extra LED for KVARH impulse and Load control Status to be incorporated as display.

24.0 ELECTRO-MAGNETIC-COMPATIBILITY & INTERFERENCE REQUIREMENT

The meter should meet EMI / EMC requirements as specified in the relevant standards described in Clause 2.0 of this specification.

25.0 SEALING ARRANGEMENT:

All meters shall be sealed by the manufacturer at its works with 2 (two) nos. Polycarbonate seals with manufacturer's logo and sequential numbers. A Tracking and recording software (25 nos. or more as per our requirement) for all new seals shall be provided by the manufacturer of the meter so as to track total movements of the seals starting from manufacturing, procurement, storage, record keeping, installation, series of inspections, removal & disposal. Seal tracking software should be submitted and installed at PC/Laptop of the purchaser before commencement of supply of meters.

26.0. Data Concentrator Unit (DCU) / Gateway for mesh connected nodes

The Data Concentrator Unit is a gateway for communication of data between the Smart Meters and the MDAS. The Data Concentrator Unit/Gateway receives information from the Smart Meter on a scheduled / need basis and stores the data, which can be accessed by MDAS for onward transfer to MDM at the Smart Grid Control Centre. The DCU/Gateway provides the central link between Smart Meters and MDAS, enabling meter read and control. DCU/Gateway shall exchange data from meters on any proven communication technology and with MDAS on GPRS/GSM communication.

26.1. Hardware & Power Supply

a) Enclosure/box of DCU/Gateway shall be IP55 compliant. The installation of

DCU/Gateway shall be suitable for clamp mounting on poles as well as DIN-rail mounting on distribution panels.

b) Power supply shall be suitable for 3-phase, 3x240V phase to neutral, -40% +20%, 50 Hz AC, so that even in case of outage in one or two phases, DCU/Gateway can be powered through the healthy phase. Capable of withstanding surges & voltage spikes of 6KV as per IEC 61000-4-5 standards. Power supply shall be terminated on suitable sized MCB to facilitate isolation during site maintenance.

c) DCU/Gateway shall consume minimum power for its operation. It shall also have rechargeable battery with backup for 1 hour for normal meter reading and to push tamper event and carry out on demand reading and the network health status / connectivity continuity & check. DCU should have feature to send power outage and restoration message to the MDAS. The battery shall have a guaranteed life of 10 years.

d) Battery backup. The battery shall have a guaranteed life of 10 years. It shall have self diagnostic feature for RTC, memory, battery, communication module, etc.

26.2. Configuration, Functionality of DCU shall have following configuration functionalities:

a) It shall be able to configure the communication with underlying nodes/meters.

b) It shall pull data from the field devices and push the data at configured intervals to the MDAS. It should also support the MDAS in pulling data from the DCU. The data acquisition (Push/Pull) frequency shall be programmable. DCU shall be capable to prioritize control commands.

c) DCU shall support DLMS/COSEM protocol for transfer of DLMS / COSEM data to MDAS and ensure secure communication to MDAS. Format of DLMS/COSEM is given in Annexe-DLMS/COSEM. The Gateway may be having IPV-6 which transfer the data to HES where it will be converted to DLMS/COSEM protocol.

d) DCU/Gateway shall have internal memory for storing interval data for at least 5 days. It shall be Non Volatile Memory (non-battery backed up) with 10years data retention in absence of power.

e) DCU/Gateway shall support on demand read and ping of individual/group of meters.

f) DCU/Gateway shall push events like tamper, power off etc. to MDAS immediately on occurrence/receipt from field devices/meters.

26.3. Communication

a) The DCU/Gateway also shall have Wide Area Network (WAN) connectivity to the MDAS through digital cellular GPRS/GSM/3G communication connection . In case of GPRS / GSM backhaul, it shall have provision for modem with SIM slot for supporting Dual-band GSM/GPRS module with a valid communication terminal port i.e. RJ45/RS232 for other communication option shall also be provided. DCU/Gateway modem should support GPRS/GSM SIM card. It shall support SIM card from any service provider.

b) DCU/Gateway shall be able to communicate with meters.

c) DCU/Gateway shall periodically monitor meter reads/downstream commands and shall retry and reconnect in case of failed events/reads.

d) After Power Interruption, on restoration of power supply DCU/Gateway shall establish communication with underlying devices as well as upstream application (MDAS) automatically.

e) The retry attempts for meter data acquisition shall be configurable globally or individual meter.

f) DCU/Gateway shall keep record of:

1) No of packet failures
2) Retry attempts
3) Missed periodic reading
4) Failure to connect

g) For each meter up to a period of 3 days and update the same to MDAS periodically.

h) DCU shall be capable to handle data of minimum 50 nos of any type of smart meter. DCU shall be able to acquire and send data to MDAS for full capacity (No. of meters/field devices it is designed for) within a period of 3 minutes. Full capacity of DCU/Gateway is required to be indicated in the offer.

i) DCU/Gateway shall be able to communicate with the nearest meters at a distance of at least 50 m, depending on topographical features. For further communication among the meters distance of the other meters with the DCU/Gateway shall not be a constraint as communication of the nearest meters shall be established with other meters through appropriate formation.

j) Remote Firmware Upgrade: The DCU/Gateway shall support remote firmware upgrades as well as remote configuration in order to add new features and functions to DCU/Gateway remotely from the control centre.

k) Configuration of programmable parameters of Smart Meters shall be done through MDAS.

26.4. Testing of the DCU/Gateway

DCU/Gateway shall be tested for EMC and EMI capability as per IEC 61000 for following:

a) Fast transient burst test

b) Test of immunity to electrostatic discharges

c) Test of immunity to electromagnetic HF field

d) The contractor shall provide IP 55 compliance test certificate.

DCU/Gateway functionalities shall ensure AMI/PLM system to achieve performance criteria as specified during performance testing of MDM.

27.0 <u>Repeater:</u>

The repeater enclosure, Fixing arrangement and power supply must be similar to DCU/Gateway enclosure and IP certified. The repeater is basically a RF trans-Receiver in the 865-867 MHz free licensed band and WPC certified as mentioned for the module inside the energy meter.

28.0 <u>Load Control Switch:</u>

Meter shall be remotely settable to support double pole Relay for connection/disconnection:

Phase and Neutral relay Disconnection on the following conditions:

a) Over current
b) Load Control Limit
c) Pre-programmed Tamper conditions (Meter Cover open detection, Neutral disturbance, Magnetic Interference)
d) Disconnect signal from Utility Control Centre such as balance unavailable in case pre-paid facility is availed by consumer. Load Control limits shall be remotely programmable. The reconnection mechanism is as follows:
e) The switch re-connection shall be decided by meter locally. It will try to re-connect the load up to 3times, with 5 minutes interval (not in case of Prepaid meter with limiting balance).
f) If the consumption is still more than the programmed limits, it will lock out and wait for 30 minutes (lock out period).
g) If the consumption is still above the limit, the procedure as defined above shall be repeated.

The brief technical particulars of this Disconnector / load switch are furnished below: -

- Disconnector Specification

Sl.No.	DESCRIPTION	Requirement
1	Operating Voltage range	130 V to 470 V
2	Operating Current range	20 mA to 72 A
3	Maximum switching power	22 kVA per phase/ per IS 15884 Annex G
4	No. of poles	Double pole in a single relay
5	Operation of switches	Simultaneous
6	Utilization Categories	UC2 or better
7	Min. number of operation	3000 (close, open each)

Reconnection mechanism:

Reconnection shall normally be done from MDAS/HES. In case of failure of communication, reconnection shall be possible through HHU locally and the same shall be password protected. For reconnection mechanism a local reset button shall also be provided on the Smart Meter.

Indication of status of relay i.e. Connected / Disconnected should be available on display as well as through communication. Connection and Disconnection should also be logged as events.

In prepaid mode the relay will be automatically be connected from HES when recharged data is available to HES.

29. FRP Board:

The FRP (Fibre-Reinforced Plastic) board to be supplied and delivered with each and every meter. The FRP board has to be fixed on the wall of consumer premises where the meter has to be installed. The smart energy meter will then be hanged and fixed on the FRP board firmly. The FRP board must be of electrical Shock proof and fire proof material. The FRP board must be type tested as per relevant IS and the type test report has to be produced before Testing and inspection from PURCHASER.

30. Head End System Hardware and Software:

AMI Implementing Agency has to submit detailed structure of the Head End System including hardware and software.

31. SMART PREPAID FEATURES

31.1 The meter shall have a non-volatile memory to retain the vital information in Case of power outages so that data will not lose.

31.2 The credit shall be debited by the meter based on the electricity consumption according to the rate including the fixed charges, minimum charges etc, as defined in tariff configuration.

31.3 The Meter shall be able to deduct fixed charges on daily basis for the full month as per the tariff applicable.

31.4 Visible low credit warning shall be provided with bi-colour LED / LCD indication (preferably Green for healthy zone, else change from green to flickering Red colour) when the credit falls below defined alarm limit.

31.5 An audible sound alarm to be provided inside the meter to alert for any prepaid feature alarm. The alarm can be kept off or on from remote HES or through Optical port locally and must be password protected.

31.6 When the credit reaches to Zero/ Allowable negative balance, the meter shall disconnect the output supply except emergency credit limit of one working Day from 17:30 hours of previous working day / second Saturdays & Sundays, National Holidays, state fixed holidays & next day till 10:00 hrs). It shall give alarm when the credit balance is Rs one hundred (Rs 100.00).

31.7 Meter shall Disconnect the output supply and Restore only when meter balance reach to the amount additional than zero.

31.8 The meter shall disconnect supply after end of such holiday hours. When meter is recharged with new credit, it shall adjust the debited amount first then normal operation shall go on.

31.9 Relay shall be provided in all phases & Neutral element in the meter to let alone fraud and single wire tamper. It shall be bi-stable type latching switch designed and manufactured in accordance with international standard of IEC and DIN EN 61810 part 1 / VDE 0435 part 201 as well as they meet overload and short circuit requirement of IEC and DIN EN 61036 / 61037 & ANSI C12.

31.10 The meter shall have a data downloading facility with smart prepaid meter events like transactions (including the debit / credit balance, consumption particulars details and also Fixed charges, Unit charges, etc.

as are applicable for post paid meter connections), alarm, overload, tamper, load survey, etc, through optical port provided with the help of HHU on which the data downloading software is available. The required software shall be supplied by the vendor free of cost.

31.11 The Load survey Data including voltage, current, KWh, KVAh, KVARH Lag, KVARH Lead, Demand (KW/KVA) & Average P.F. shall be available for last 60 power on days both in tabular as well as graphical format and Historical Data shall be available for last twelve months.

31.12 The Tamper Data

The following provisions are mandatory for an AIA:

1. **NABL calibration of all the instruments used for testing with sealing of above instruments from NABL authority. Certificates with NABL Logo must be presented at the time of inspection.**
2. **Automatic meter test bench is mandatory with NABL certification as mentioned in 1 above with at least 10 no. meter testing facility at a time with optical scanner.**
3. **BIS certificate to be provided before offer for testing.**
4. **All other type test, GOI or manufacturer certificates related to components, EMC/EMI, WPC etc. are to be submitted before offer for testing.**
5. **The test procedure for accuracy of meter, Checking of Downloaded Data through BCS and to compare it with MDAS data, Test on Tamper, Test on Ultrasonic welding of Meter, Component verification by breaking a meter, Physical Checking of meter, DCU, Repeater are to be followed as per the Annexe-I.**
6. **A proto type HES to be created at the time of testing with all the software , DCU, Repeater, SIM card, BCS loaded in a PC/Laptop, HHU to check all the possible communications to report to HES in its MDAS.**
7. **A demonstration on 6 above with meter is to be done at the time of qualifying the bidder technically. If it passes all the criteria at this demonstration then the price BID will be opened.**

The following additional tests shall be carried out in addition to the acceptance tests specified in IS 13779 / 1999 (amended up to date).

A. Acceptance Tests for smart prepaid features

a) Test of credit balance & debit
b) Test of friendly credit hours, start & end time there of
c) Test of disconnect the output supply when credit reach to Zero.
d) Test of reconnect the output supply on providing credit limit.
e) Test of disconnect output supply if load / current exceeded the preset value in the meter.
f) Test of reconnect output supply if load / current falls below the preset value in the meter.
g) Test of visible & audible low credit warning.
h) Test of application of tariff and TOU.

Samples picked up by the inspecting officer for acceptance tests shall be first subjected to 'soaking' at 70 +/- 2 Deg. C for four hours. After normalizing the acceptance tests as stipulated in CBIP (with latest amendments) and IS shall be carried out by the supplier in presence of purchaser's representative. Also the following additional tests are carried out on mutually agreed quantity of meters from each lot offered for inspection.

i) Magnetic induction of external origin (AC&DC).
ii) Tamper & Fraud protection as per Cl. 12.0.

B. Other Acceptance Tests

a) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440V between phase & neutral without damage / problems.
b) Tamper conditions as stated in this specification.
c) Power consumption tests
d) Limits of Error: Limits of variation in percentage error due to change in voltage shall not exceed the values given below.

Sl. No.	Influence quantities	Value of current	Power Factor	Limits of variation in % error for class meter
A	Voltage Variation - 15% to + 10%	Ib Ib	1.0 0.5	0.7 1.0
B	Voltage variation - 40% & +20%	Ib Ib	1.0 0.5	1.1 1.5

e) The meter shall be tested at – 15% and at – 40% of reference voltage as well as + 10% and + 20% of reference voltage and shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.

f) For other influence quantities like frequency variation, the limits of variation in percentage error will be as per IS 13779 / 1999 (amended up to date).

g) The meter shall comply all the tests for external AC / DC (except 0.2 T AC magnet) magnetic field as per CBIP Tech-Report 88 with latest amendments. Moreover the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. If the accuracy of the meter gets affected during the test, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor. After removal of magnet meter shall be subject to accuracy test as per IS 13779 / 1999 (amended up to date). No deviation in error is allowed in the accuracy as per specifications.

h) Test on Ultrasonic welding to be done for 2 no. meters as a destructive test. The meter cover will be forcibly opened by breakthrough with knife, Screwdriver or similar tools. If the cover detached with cracks at both cover and base then it will be treated as passed. Otherwise it will be declared as failed.

ANNEX –I

TESTS:

i) Type Testing of Meter:

The offered meters should be type tested at any NABL accredited laboratory in accordance with IS 13779 with latest amendments, CBIP Report 325 with latest amendments. The type test report should not be more than 3 (three) years old. A copy of the Type Test results should be enclosed with the offer . If there is any modification in the design/parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

Type Test Certificate from any NABL accredited Lab. shall only be considered.

Type test certificate should contain the following information clearly:

1) Class of accuracy. 2) Meter constant

ii) Acceptance tests :

A. The acceptance tests as stipulated in CBIP / IS (with latest amendments) and shall be carried out by the supplier in presence of purchaser's representative. Lot size, sampling and procedure to be followed for acceptance test will be as stated below .

The following tests shall be carried out on all the meters thus selected at random.

The WBSEDCL's Engineers will witness the various quality control measures adopted for verification of different components of meters and satisfy themselves about the same. They will also inspect the protocol for maintaining the accuracy of the meter testing equipment with reference to the standard at manufacturer's meters testing station.

1. Physical examination of the meters.
2. Non-registration with Voltage along at 70% V ref and at 120% Vref.
3. Starting current at 0.2% I basic Upf.
4. High voltage test.
5. Insulation resistance test.
6. Test of protection for withstanding 433 volt between phase & neutral for a period of at least 1(one) hours without any load.
7. Test of endurance up to 150% I max.

Limits of error on all the sample meters at:

1% I basic 1.0 pf. (±2% is preferable but should not exceed ±3%)

2% I basic 1.0 pf.

5% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead

10% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
50% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
100% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
200% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
600% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
Test of meter constant and meter dial for one unit at 200% I basic, 0.866 pf. Lag.
Power loss on voltage & current circuit.
Repeatability of error test at 5% I basic Upf & 100% I basic Upf.
The maximum divergent should be less than 0.1(Utility specific requirement)

If anyone of the meter fails on any of the above tests, the lot will be rejected.
Further testing for 1 No. sample meter will be carried as follows:
Magnetic induction of external origin (AC & DC).

1. Electro Static Spark Discharge of 35KVp
2. Tamper and Fraud protection as per Clause 12 (Anti-tamper feature) of our specification.
3. Dry –heat test as per clause 12.6.1 of IS: 13779/99.

At least one sample selected from any lot of the meters offered for inspection will be sealed by us and handed over to the supplier for testing at NABL accredited laboratory. Presence of purchaser's representative during dry heat test at NABL accredited laboratory is not required. But in the test report meter Sl. No. & meter body seal nos. is to be mentioned.

Shunt test by applying 100 Amps continuous load for minimum two hours after removing it from the meter for verification and conformation for quality of shunt & its E-beam welding.
• Physical verification of internal components as per given ***component list***.
If the meter fails on any of the above test, the lot will be rejected. Facilities/arrangement for conducting ageing test should be available with the manufacturer.

iii) Retesting after delivery:
WBSEDCL will carry out re-testing of the supplied meters at their laboratory. Re-testing of the supplied meters will be conducted on sample meters collected from different stores of the consignees as per the procedure followed for acceptance test (except dry heat test & shunt test) during inspection & testing of the supplied meters at manufacturer's works. Re-testing of the supplied meters will be completed within one month from the date of receipt of meters at different stores. Date of re-testing of meters will be intimated to the supplier for witnessing testing of the meters. In case the meters are not in order as per our observation during inspection and testing of the supplied meters, the lot will be declared defective and in that event meters supplied are to be replaced by the manufacturers free of cost including free transportation from the site to their works and back. The replaced meters are to be offered for inspection & testing and Acceptance test of will have to be carried out by the supplier in presence of purchaser's representative.

iv) Routine Tests :
Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report-325 and after sealing of the meters, the manufacturers will submit the routine test report of all the meters as well as a statement

showing seal Sl. Nos. against each meter, Sl. No. of offered lot in soft copy (MS WORD or EXCEL format), to the Chief Engineer, DTD, along with offer letter for acceptance test.

v) TEST FACILITIES:

The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipments/ instruments.

NOTE: The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchaser's representative

The manufacturer shall have the following testing facilities to ensure accurate calibration :

1. AC high voltage test
2. Insulation test
3. Test of no load condition
4. Test of Starting condition
5. Test on Limits of error
6. Power loss in voltage and current circuit
7. Test of Repeatability of error
8. Test of meter constant
9. Test of magnetic influence

Component Specification

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type. All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. no.	Component Function / Feature	Requirement	Make / origin
1	Current Element	E-beam /spot welded shunts shall be provided in the phase element and C.T. in the neutral. Alternatively, both the current elements (phase & neutral) shall have Shunts with proper isolation	Any make or origin conforming to IS-2705
2	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type along	USA :Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, Texas Instruments, Teridian, Japan: NEC,

		with the ASICs.	Freescale, Renesas, Holland: Phillps
3	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: National Semi Conductor, Atmel, SAMES, Texas Instruments,Teridian, ST, Microchip, Japan: Hitachi, OKI, Renesas, Freescale, Holland / Korea: Phillps
4	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70o.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range. Singapore	Singapore: Bonafied Technologies, Korea: Advantek, Japan : Hitachi, SONY, Hijing, Truly Semiconductor. Chaina: Tianma
5	Communication modules	RF and NIC card inside meter for com from meter to DCU/Gateway and GSM/GPRS/3G cellular network from DCU/Gateway to HES for single phase meter and for 3 phase meter it will be GSM/GPRS/3G cellular network from meter to HES.	Any national or international make with proven in any project in India .
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, Texas Instruments, HP, Agilent, Avago Japan: Hitachi, , Germany /USA :Osram Germany: Siemens, Holland / Korea: Philips, Taiwan: Everlight,
7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the	As Specified

		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	
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: Atmel, Philips, ST, National Semiconductors, Onsemi, Texas Instrument, Japan: Toshiba, Fairchild, Murata, Hitachi.EPSON. Ligitec, Panasonic OKI, EPCOS, Rohm, Freescale Germany: Siemens. Korea: Samsung.
9	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.	
10	Battery	Lithium / Lithium-ion /Ni-Mh with guaranteed life of 10 years	Renata, NationalPanasonic Varta, Tedrium, Sanyo, Tekcell, Tadiran, Duracell, Mitsubishi, Sony, Maxell, Elegance.
11	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Dallas, Atmel, Motorola, NEC, Renesas, Texas Instruments, ST, Microchips, Epson Holland / Korea: Philips, Japan: NEC, OKI, Hitachi, Mitsubishi, Freescale

A.C. 3PHASE, 4WIRE SOLID STATE (STATIC) WHOLE

CURRENT LAG ONLY ENERGY METER WITH BACKLIT LCD DISPLAY USED FOR BALANCED/UNBALANCED

LOAD, ACCURACY CLASS 1.0,DLMS Compliant

CURRENT RATING : 20-100 AMPS

Technical Specifications for DLMS complied A.C. 3-Phase,4-Wire , Solid State (Static) Fully Electronic Prepaid as well as Post paid Smart Energy Meter, Accuracy Class: 1.0, Current Rating (20-100) A, with Backlit LCD Display for 3 X 240 V System with DCU/Router/Gateway & Repeater.

1.0 SCOPE

a) This specification covers design, engineering, manufacture, testing as per format submitted with offer for inspection and supply of A.C. Three phase, Four wire solid state (static) fully electronic, Lag only, DLMS complaint, with Prepaid & Post Paid feature, energy meters of accuracy class 1.0 and current rating (20-100) A, with backlit LCD display for 3 X 240 Volt systems as per requirement in this specification. The meter should be capable of recording and displaying energy in KW, KVArh and demand in KW, KVA for three phase as well as single phase A.C. loads respectively for power factor range of Zero lag – unity – Zero lead. Meters should have facility/ capability of recording tamper information with Remote Firmware Upgradation.

b) It is not the intent to specify completely herein all the details of the design and construction of meter. However the meter shall conform in all respects to high standards of engineering, design and workmanship shall be capable of performing commercial operation continuously in a manner acceptable to PURCHASER, who will interpret the meanings of drawings and specification and shall have the right to reject any work or material which in its judgment is not in accordance therewith. The offered meter shall be complete with all components, accessories necessary for their effective and trouble free operation of the system for the purpose mentioned above. Such components shall be deemed to be within the scope of bidders supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

c) The AMI Implementing Agency (AIA) shall quote against this Tender. The AIA may be a Meter Manufacturer or a Communication provider or a IT based organisation. It is mandatory that in case of all manufacturers, the offered meter shall be ISI marked and bidder shall have to furnish valid BIS certification along with the offer. The meter manufacturer may co-opt communicating and proprietary HES agency as their consortium partner or the Communicating agency / HES

agency may co-opt the other two as their consortium partner. All the terms and conditions will be imposed upon the Bidder. No responsibility of consortium partner of the bidder will be entertained by Purchaser.

2.0 STANDARDS APPLICABLE

Unless specified elsewhere in this specification, the performance & testing of the meters should conform to the following Indian/International standards, to be read with up to date and latest amendments/revisions thereof as on 90 days prior to floating of tender.

Sl. No.	Standard No.	Title
1	IS 13779, 1999 read with its latest amendments	Specification of AC Static Watt hour meters class 1.0 and 2.0
2	IS 15959:2011 with latest amendment no 3.	Data exchange for electricity Meter reading, Tariff and Load Control – Indian Companion Specification Category C3 meters.
3	CBIP Report No.325 read with latest amendments.	Specification for AC Static Electrical Energy Meters
4	IS 12346 (1988)	Specification for testing equipment for A.C. Static Electrical Energy Meter (latest amendment).
5	C.E.A. Regulation No. 502 / 70 / CEA / DP&D dt 17/03/2006	Central Electricity Authority (Installation and Operation of Meters) Regulation, 2006.
6	IS 14434 (1998)	Polycarbonate Moulding and Extrusion Materials.
7	IS-15884	AC circuit connected Static Smart prepaid Meters for Active Energy (Class 1 and Class 2)
8	IS-16444	A.C. Static direct connected watthour smart meter

3.0 CLIMATIC CONDITION

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions.

i) Maximum Ambient Air Temperature in shade: 55 Degree C
ii) Minimum Ambient Air Temperature: (-) 10 Degree C.
iii) Maximum Relative Humidity : 95% (non-condensing)
iv) Minimum Relative Humidity: 10%
v) Height above mean sea level: Up to 3000 meters
vi) Average number of tropical monsoon per annum: 5 months
vii) Annual Rainfall : 100 mm to 1500 mm

4.0 SUPPLY SYSTEM

System	3 Phase 4 Wire
Rated voltage (Vref)	3X240 V – Phase to Neutral
Rated Current	Basic current:- 20 Amps (lb), Maximum current:- 100 Amps (l max)
Rated Frequency	50 Hz

5.0 POWER FACTOR RANGE

The meter should be suitable for full power factor range from zero (lagging) through to Unity to zero (leading).

6.0 POWER SUPPLY VARIATION

The meter should be suitable for working with following supply system variations.

System	3 Phase 4 Wire
Specified range of operation	70% to 120% of reference Voltage i.e. 240 Volt.
Frequency	50Hz +5%

7.0 ACCURACY

7.1 Class of accuracy of the meter should be 1.0. The accuracy should not drift with time.

7.2 Maximum error limit at 1% Ib, UPF should be within +/- 2%.

7.3 For voltage variation use of "between 70% to 50%"of Vref. Allowable error limit is +/- 4%.

8.0 POWER CONSUMPTION

8.1 Voltage Circuit:

The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency should not exceed *1.0 Watt and 4 VA* respectively (as per existing PURCHASER requirement.

8.2 Current Circuit:

The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 1 VA (as per existing WBSEDCL requirement.

For Prepayment meters Voltage and Current Circuit Power Consumption shall be as per IS15884.

9.0 STARTING CURRENT & RUNNING AT NO LOAD

The meter should start registering energy at 0.2 % of basic current at unity power factor and first pulse must be appeared within 10 minutes (i.e. time between two consecutive pulses).Running at no load: When 70%Vref and 120%Vref voltage is applied and no current flows in the current circuit, the test output of the meter should not produce more than one pulse.

10.0 MAXIMUM CONTINUOUS CURRENT

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification. The same is indicated in table in clause 4 above.

11.0 GENERAL & CONSTRUCTIONAL REQUIREMENTS

11.1 Meters should be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured.

a) Personal safety against electric shock.

b) Personal safety against effects of excessive temperature.
c) Protection against spread of fire.
d) Protection against penetration of solid objects, dust & water.

11.2 The meter should be designed with ASIC (application specific integrated circuit) and should be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH (Pin Through Hole) technology.

11.3 The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent, for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it should not be black in colour. The meter casing should not change in shape, colour, size, and dimensions when subjected to 200 hrs on UV test as per ASTMD 53. It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75. For testing of changing colour72 hrs on UV test is applicable. The meter cover should be sealable to the meter base with at least 2(two) nos. seals.

11.4 The meter should be supplied with a transparent extended terminal block cover (ETBC). The ETBC should not be easily detachable from the base and be secured to the base using a hinge/ without hinge arrangement. ETBC should be closed at the bottom to prevent access for wires to terminal holes, but should have a slot of size 20mm X 20 mm(at least 375sq mm) on extreme right hand side of the bottom of the terminal cover. The terminal block should be made of high grade non-hygroscopic, fire retardant, fire resistant and glass reinforced poly-carbonate with terminal holes of minimum diameter 9.5mm and should be suitable to accommodate the insulation of the conductors, meeting the requirement of *IS 13779 / CBIP technical report-325 (As this is the latest CBIP Guidelines).* The minimum centre to centre distance between adjacent terminals should be 13 mm. Terminal cover should have provision for sealing with at least one seal. The embedded portion of the sealing arrangement, i.e. the arrangement to hold the sealing screw for terminal cover should be such that the same cannot be uprooted in any case without breaking/damaging the terminal block. The bidder shall submit relevant documents regarding the procurement of polycarbonate material. The polycarbonate material of the following manufacturers only shall be used:

a) G.E. Plastics/SABIC LEXAN 943A, or equivalent like 123R for Top cover & Terminal cover/ LEXAN 503R or equivalent like 143R for base & Terminal Block.
b) BAYER - Grade corresponding to above
c) DOW Chemicals- - DO –

d) MITSUBISHI- - DO –
e) TEJIN- - DO –
f) DUPONT- - DO -

11.5 All insulating material used in the construction of meters should be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion should be effectively protected against corrosion during operating life by providing suitable protective coating.

11.6 The meter should conform to the degree of protection minimum IP 51 for protection against ingress of dust, moisture and vermin.

11.7 The meter should be capable of providing phase to neutral protection up to 433 V for 10 minutes.

11.8 The manner of fixing the cables to the terminal block should ensure adequate and durable contact such that there is no risk of loosening or undue heating. Meter should have 2 (two) screws in each terminal for effective clamping of cables. The screws shall not have pointed ends at the end of the thread. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter should be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections should be so designed that contact pressure is not transmitted through insulating material. All terminals and connecting screws and washers should preferably be of tinned / nickel plated brass material. The terminals and all connecting screws will be of suitable material capable of withstanding a current of 150% of Imax for two hours, continuously.

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

11.10 The meter should have fixing holes, at least one at top and two at bottom. The top hole should be such that the holding screw is not accessible after fixing the meters. The lower fixing screws should be provided under the sealable terminal cover.

11.11 The meter should be fitted with CT or SHUNT for measuring current in the phase element. The Neutral element may have either C.T. or SHUNT or HALL EFFECT SENSOR with proper isolation

The shunts, used in current circuit must be of high quality having high thermal stability and temperature co-efficient. The shunts should

be E-Beam / Spot welded. In case of Hall Effect Sensor, meter should record as per requirement of technical specification in normal and tamper conditions and life of battery used for recording and display during single wire operation as per clause 12 (IX) should be guaranteed for 10 years.

11.12 The meter cover should be permanently fixed to the meter base by using ultra sonic welding or any other technology which is either equally or more efficacious in such a way that the meter cover can't be opened without breaking the same i.e. the meter should be break-to-open type. In case any attempt is made to separate the meter cover from the base by using any tools / implements / device, there should be visible evidence of tampering or attempt to open. The bidder will have to specify the type of technology used by him and will also indicate the tests / standard required for testing the same along with test certificates. However, sealing with commonly available adhesives will not be accepted.

11.13 Meter should have a permanent indication in its display as well as logging of tamper in case of removal of top cover, even in power off condition and it should not disappear even if cover is re-fitted. It should be treated as non roll over event .

11.14 Sealing Arrangement: The sealing screws used for the meter cover shall be fixed upside down so that these are tightened from the rear or screw less design for fixing the base and cover but provision for sealing arrangement must be there. A run through screw (stud) has to be provided from bottom side & sealing is to be done on the top side of the meter. Two independent sealing screws are to be provided at each sides of the meter casing. The sealing screws shall be Tinned Brass or Nickel Plated Steel/Brass. In addition to the sealing screws provided to the meter cover, the sealing screws of the terminal cover should also be Tinned Brass or Nickel plated steel. Meters must be supplied with two no manufactures' seal between meter base and cover at both sides. If lock /click fit integrated seals are used during sample Meter, after through checking acceptance of said seal will be decided.

12.0 ANTI-TAMPER FEATURES

The meter should have the following anti-tamper features:

i) *Current Reversal:* The meter shall be capable of recording energy correctly even if the input and output terminals are interchanged in one, two or all the three phases including logging of tamper.

ii) The meter shall work correctly irrespective of phase sequence of supply (there must be an indication in display & down loaded data). Tamper alerts is not required. But it must be shown in instantaneous parameters both in tabular as well as in phasor diagram.

iii) The meter shall work correctly even in absence of neutral as per IS13779. Accuracy in between 70% Vref to 50 % Vref must be maintained within $\pm$4%.

iv) Meter should record energy within maximum error of $\pm$ 4% on injection of DC (approximately 550V), pulsating DC (7-10 Hz), Chopped AC in Neutral. However meters which are immune or maintain better accuracy, will be preferred. Maximum chopping for AC injection will be 25% to 30% at peak end.

v) The registration shall not be affected more than $\pm$ 4% if high frequency (60-100 Hz) A.C. Voltage w.r.t. earth is applied to the meter neutral. Meters which are immune or will maintain better accuracy, will be preferred.

vi) High Frequency Jammer Circuit Test – Meter should be immune on this test

vii) The meter should be immune to Electro Static Discharge or Sparks of 35 KV (approx) induced by using frequency-generating devices having very high output voltage.

N.B.:-Tests in this respect will be conducted by using commonly available devices and during spark discharge test, spark will be applied directly at all vulnerable points of the meter for a period of 10 to 20 minutes. The accuracy of the meter and acceptance criteria as per guidelines specified in Appendix J of CBIP 325. After application of spark discharge meter should record correctly within the specified limits of errors. Beyond 35 KV the meter should record tamper if not immune. It should record the event under Indian Event Reference of others type with Event ID's 249 for Occurrence and 250 for Restoration with OBIS (0.0.99.98.4.255). Other details are applicable as per "Others Tamper Profile of IS 15959.

The meter shall be capable of recording; occurrences and restoration with date and time i.r.o. the following tamper conditions:

a) Missing Potential for all phases (phase wise), even without any load drawal.
b) Current reversal for all phases (phase wise). (It must not be restored without threshold current).
c) Power failure.. Minimum 50 events need to be given separately). Occurrence time shall be of 5 minutes & restoration time shall be instantaneous.
d) Magnetic Disturbances (As per IS 13779 & CBIP 325 along with latest amendments)
e) Neutral Disturbances (Meter may remain immune and maintain its class of accuracy. If not immune then error must be in positive side).
f) C.T. open
g) C.T. Bypass/ C.T. Short.
h) Over Current (during existence of this tamper current unbalance tamper should not log).

Snapshot values of Phase Voltage, Phase Current & Phase wise Power Factor, Active Energy value during occurrence & restoration to be provided in all the above mentioned tamper conditions in BCS with date and time. (In Event logging Snapshots should be considered when the actual phenomenon occurred)

The occurrence and restoration of tamper should be equal to 5 min (programmable). (Except Magnetic and Neutral Disturbances tampers) *Magnetic tamper should appear instantaneously, ND within 3 min.*

All authenticated commands should be Base Computer Software controlled.

All transactions with meter should be date and time logged, in the downloaded data minimum last 12 such transactions need to be provided.

Properly designed meter tamper logic should be provided and clearly explained in the bid. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to any source side abnormalities. More than one tamper *CT related/ PT related/ others* should not be logged at a time. A minimum of 300 events (one event means either occurrence or restoration) of all types of tamper with date & time stamping should be available in meter memory compartment wise. The logging will be on FIFO basis. The events will be divided into three compartments like *CT related (148 Events), PT related (88 Events) and others (64 Events)*.

- **Meter should have a continuous and clear indication in its display if top cover is removed or opened and even re-fixed (non rollover) and only cover open must be logged in BCS without any restoration. Auto scroll display may be sacrificed for that COVER OPEN.**

13.0 DISPLAY

13.1 The meter shall have Alphanumeric display with at least **8 full digit** with LCD backlit display, having minimum character height of 10 mm**. KWH Energy registration should be with at least 6 full digits.** No decimal is accepted for main KWh & KVAh register. **All display digits for KWH shall be displayed in the meter display (**figures prefixing the value in display should show 0 in display).

13.2 The measured value(s) should be displayed on a Liquid Crystal display (LCD) register. The height X width of the digit should be minimum 8.0 X 5.0 mm. Higher square area also acceptable. The display should have backlit capability for easy reading from 2 meters. When the LCD is placed at a constant temperature of 65 degree C for a period of 30 minutes in operating condition and 80 degree C for 30 mins. Under de-energized / storage condition, it should not get deformed. The LCD should be of TN (Twisted Pneumatic) type with display size area of at least 40 X 15 mm. The display should have wide viewing angle of at least 70 deg. Dot Matrix type LCD will not be acceptable. Display should have viewing angle 35 degree up and down from eye level.

13.3 The data should be stored in non-volatile memory (NVM). The non-volatile memory should retain data for a period of not less than 10 years under

un-powered condition. Battery back-up memory will not be considered as NVM.

13.4 The register should be able to record and display starting from zero, for a minimum of *1500 hours (as per in IS 13779 and CBIP 325),* the energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.

13.5 In addition to provide serial number of the meter on the display plate, the meter serial number should also be programmed into meter memory for identification through communication port for CMRI / Laptop / meter reading print out.

13.6 It should be possible to read the meter during power off condition. It should also be possible to read the meter with CMRI / Laptop in this condition. If battery is used for the same, it should be a separate battery and not the one used for RTC, i.e., the RTC battery and the battery used for display during power off condition should not be the same. The battery should be of high quality Lithium / Lithium – ion battery, with life of at least 10 years. In case of Lithium battery, no. of operations per day are to be restricted to maximum 5(five) operations so that battery life is not hampered during ten years.

13.7 Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parameters to be provided (Factory programmable). Back lit provided for clear visibility should be uniform throughout all part of the LCD.

13.8 The meters should have auto-display mode for pre-selected parameters. Push-Button mode of display should display all parameters and it should have priority over auto mode. The meter should give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with date and time of first occurrence, last occurrence and last restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, pen-ultimate restoration and last occurrence.

Connection check, Phase sequence and self diagnostic should give clear message on display.

The meter shall have a test output **(blinking LED)** accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device should be provided

in the form of two separate LED for active and reactive energy. Separate LED should also be used with proper separation and indication.

14.0 DISPLAY SEQUENCE:

The meter should display the required parameters in two different modes as per the sequence given below.

A) Auto Display Mode
B) Push Button Mode

A) Auto Display Mode:

1. *LCD Test*
2. *Meter serial no*
3. *Real Time*
4. *Date*
5. *Credit Balance in INR*
6. *Present load cost in Rs/Kwh*
7. *Cumulative Active Forwarded Energy (KWH)*
8. *Cumulative Apparent Forwarded Energy (KVAH)*

B) Push Button Mode:

1. *LCD Test*
2. *Meter serial no*
3. *Real Time*
4. *Date*
5. *Cumulative Active forwarded energy in kWh.*
6. *Cumulative Reactive forwarded energy(Lag) in kVArh*
7. *Cumulative Reactive forwarded energy(Lead) in kVArh*
8. *Cumulative Apparent forwarded energy in kVAh.*
9. *Last Bill Maximum demand (kW) & KVA with date and time.*
10. *Billing period counts*
11. *Total tamper count.*
12. *Last Bill Active Forward energy in kWh.*
13. *Last Bill Apparent energy in kVAh.*
14. *Instantaneous Load (KW/KVA)*
15. *Instantaneous phase voltages.*
16. *Instantaneous Phase Currents.*
17. *Instantaneous Neutral Current*

18. Maximum demand kW and KVA for Current month with date & time.
19. Supply Frequency
20. TOD Cumulative Active Energy in KWh.
21. Instantaneous Power Factor.
22. NIC card Status.

The meter should also be capable of offering a high resolution display which should enable conducting of dial testing by the user in the shortest possible time and as a minimum, the meter should be capable of offering a resolution of 4 digits after decimal & 2 digits before decimal for the high resolution KWh display or 2 digits after decimal and 4 digits before decimal for the high resolution Wh display. Any other useful display will be acceptable. Accuracy test for low load will be measured by short dial test as well as pulse count test.
High resolution energy parameters are required for active, reactive and apparent energy.

Engineering Display Mode:
This display shall be available only upon the application of valid codes on the meter, and shall enable the display of the following:

1. *Software version*
2. *All the limiting parameters value such as load limit, current limit & emergency credit limit.*
3. *Switch operation counts.*

15.0 MAXIMUM DEMAND REGISTRATION AND RESET

Meter should continuously monitor and calculate the average maximum demand for each demand interval time of 15 minutes and maximum of these in a calendar month should be stored along with date and time when it occurred. The maximum demand should automatically reset at 24:00 hrs. of the last date or 00:00 hrs. of the first date of each calendar month and the corresponding value along with date/time stamp shall be transferred to Billing (History) registers. The integration period should be set as 15 minutes, on real-time basis.

The billing purpose parameters Total and TOD wise (KWH, KVARH lag and lead, KVAH, MD in KW and KVA, Average PF, Average LF) should be recorded and should be available in Bill (History) for a minimum period of last 12 months in BCS.

RESETTING OF MAX. DEMAND:

The meter should be capable of recording the Apparent MD with integration period of 15minutes (programmable). The meter should also record MD at preset date and time. MD reset should be through all of the three means : 1) Manually 2) Through authenticated MRI or Remote Communication Command, 3) Automatic resetting at 00:00 Hrs at fast day of the Month. Facility to invoke any of the above through authenticated MRI command should be provided. By default the M.D. reset will be at preset date and time i.e. in this case at the 1st day of each calendar month at 00:00 hrs. MD reset button should have proper sealing arrangement. Push button for scrolling display & MD reset should be separate.

16.0 TIME OF USE / TIME OF DAY MONITORING:

The meter should offer the capability of time of use monitoring for energy.The meter should have facilities to record Active, Apparent Energies and **Apparent MD** in at least 8 zones. At present TOD timings will be programmable in three zones as follows:

TOD – 1 06:00 Hrs to 17:00 Hrs,

TOD – 2 17:00 Hrs to 23:00 Hrs,

TOD – 3 23:00 Hrs to 06:00 Hrs of next day.

8 no TOD Energy registers should be visible in display as well as BCS end **(Desirable condition for future upgradation of meter)**

Register are fixed (3 or 8 Nos) but In case of any change of TOD timing in future as per directive of SERC, the same is to be incorporated by the supplier even after completion of the order as per instruction from the appropriate authority. *The TOD timings must be programmable and it can be possible to change the time slot / period for TOD recordings through authenticated BCS using Laptop, MRI and transferring vend codes through HES. Necessary software for the same is to be provided by the bidder.*

In BCS TOD parameters are KWh,KVAh, KW and KVA.

17.0 SELF- DIAGNOSTIC FEATURE

The meter should be capable of performing complete self diagnostic check to monitor integrity of data memory location at all time. The meter should have indication for unsatisfactory / nonfunctioning / malfunctioning of the following:

a) Time and date on meter display
b) All display segments on meter display
c) Real Time Clock (RTC) status in meter reading prints out at BCS end.
d) Non-volatile Memory (NVM) status in meter reading prints out at BCS end.
e) Synchronisation of time of meter & HES clock from MDAS instantly for less than 3 minute and through HES for more than 3 minute with alarm at HES.

18.0 COMMUNICATION PORTS AND PROTOCOL:

The meter should have a galvanically isolated optical communication port for data communication with CMRI / Laptop. No extra port is required. The port should be compatible with IEC 1107. The main communication protocol of the meter will be through RF/RF with NIC card. The RF module will communicate in 865-867 MHz free license Band certified from WPC, Ministry of Communication, GOI.

19.0 CMRI / LAPTOP / BCS REQUIREMENTS:

The Common Meter Reading Instrument (CMRI / Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI / Laptop. The BCS should be WIN 7/8/10 pro based and copy righted. The data stored in the meters memory should be available on the BCS. This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, and history data should be convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI

/ Laptop software. The supported parameters must be downloaded from the meter itself. This functionality must be implemented in sing le software, no separate executable will be used for different types of meters which supports DLMS. Mapping of OBIS code as per DLMS protocol for instantaneous / billing / event / transaction parameters will be checked through third party DLMS conformity testing tool. Test for automated Meter reading will be conducted by downloading Meter data through Modem at our system through third party software also. The bidder has to supply also the Meter Reading protocol and API (if required) free of cost. The protocol should not be complicated & should be easily understandable to introduce compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies. The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost. BCS supplied by the manufacturer should be compatible with meters to be supplied against this tender as well as with previous supplied meters. Optical Port of manufacturer cord should have either magnetic locking or Click slip (latch) fitting. It should not be possible to change/alter date and time in the meter by sending commands from the CMRI or directly through Laptop. For alteration of RTC time, MD resetting, change of TOD timing, it should be possible to be done only through authenticated commands from BCS after scheduling of CMRI/Laptop for a particular meter at the time of reading the meter. No alternation/change on the above points should be possible through authenticated commands from BCS without scheduling of CMRI/Laptop for meters. Moreover, no alternation/change should be possible using CMRI only, i.e. the control has to be with the BCS.

The billing purpose parameters Total and TOD wise (KWH, KVARH lag and lead, KVAH, MD in KW and KVA, Average PF, Average LF) should be recorded and should be available in Bill (History) for a minimum period of last 12 months in BCS.

20.0 DISPLAY POWER UP IN ABSENCE OF MAINS SUPPLY

The meter should have the provision of providing the display of billing parameters (Auto Display) in absence of main supply. Press of push button should activate the display to facilitate hands free meter reading with auto-off provision. Meter may be Power on after 2 years, battery backup Power must be stable on that condition. Battery for RTC should not be less than 350mAh (±10%). It should be possible to read the meter using CMRI / PC during power-

off condition using this facility. Battery for downloading and Display power up purpose should not be less than 650 mAh (±10%) and it should be chargeable. The meter must be capable of down loading data either through optical port or from HES during Power Off condition.

21.0 MARKING OF THE METER

The marking on the meter should be in accordance with relevant clauses of IS 13779. Colour of the Name Plate will be Light Grey. The basic marking on the meter nameplate should be as follows (all other markings as per IS 15959A2_R1 clause E - 10.1 should also be there):

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (imp/kwh)
k) Class index of meter
l) "Property of WBSEDCL"
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 5 1/2 Yrs. from the date of delivery)
o) BIS marking
p) Place of manufacture
q) Bar coded Serial no. of the meter along with manufacturing year & month.
r) DLMS Category Marking "C2"
s) Right and Left LED Nomenclature

22.0 CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter should be clearly shown on terminal cover.

23.0 OUTPUT DEVICE

The meter should have a test output accessible from the front and capable of being monitored with suitable testing equipment while in operation at site. The test output device should be provided in the form of LED output. There should be adequate clearance of the test output from other outputs so that there is no interference of other outputs while performing accuracy test with standard scanners. The relation between test output and the indication on display should comply with the marking on the name plate (imp per KWh). Two extra LED for KVarh impulse and Load control Status to be incorporated as display.

24.0 ELECTRO-MAGNETIC-COMPATIBILITY & INTERFERENCE REQUIREMENT

The meter should meet EMI / EMC requirements as specified in the relevant standards described in Clause 2.0 of this specification.

25.0 SEALING ARRANGEMENT:

All meters shall be sealed by the manufacturer at its works with 2 (two) nos. Polycarbonate seals with manufacturer's logo and sequential numbers. A Tracking and recording software (25 nos. or more as per our requirement) for all new seals shall be provided by the manufacturer of the meter so as to track total movements of the seals starting from manufacturing, procurement, storage, record keeping, installation, series of inspections, removal & disposal. Seal tracking software should be submitted and installed at PC/Laptop of the purchaser before commencement of supply of meters.

26.0 Data Concentrator Unit (DCU) / Gateway for mesh connected nodes

The Data Concentrator Unit is a gateway for communication of data between the Smart Meters and the MDAS. The Data Concentrator Unit/Gateway receives information from the Smart Meter on a scheduled / need basis and stores the data, which can be accessed by MDAS for onward transfer to MDM at the Smart Grid Control Centre. The DCU/Gateway provides the central link between Smart Meters and MDAS, enabling meter read and control. DCU/Gateway shall exchange data from meters on any proven communication technology and with MDAS on GPRS/GSM communication.

26.1. Hardware & Power Supply

a) Enclosure/box of DCU/Gateway shall be IP55 compliant. The installation of DCU/Gateway shall be suitable for clamp mounting on poles as well as DIN-rail mounting on distribution panels.

b) Power supply shall be suitable for 3-phase, 3x240V phase to neutral, -40% +20%, 50 Hz AC, so that even in case of outage in one or two phases, DCU/Gateway can be powered through the healthy phase. Capable of withstanding surges & voltage spikes of 6KV as per IEC 61000-4-5 standards. Power supply shall be terminated on suitable sized MCB to facilitate isolation during site maintenance.

c) DCU/Gateway shall consume minimum power for its operation. It shall also have rechargeable battery with backup for 1 hour for normal meter reading and to push tamper event and carry out on demand reading and the network health status / connectivity continuity & check. DCU should have feature to send power outage and restoration message to the MDAS. The battery shall have a guaranteed life of 10 years.

d) Battery backup. The battery shall have a guaranteed life of 10 years. It shall have self diagnostic feature for RTC, memory, battery, communication module, etc.

26.2. Configuration, Functionality of DCU shall have following configuration functionalities:

g) It shall be able to configure the communication with underlying nodes/meters.

h) It shall pull data from the field devices and push the data at configured intervals to the MDAS. It should also support the MDAS in pulling data from the DCU. The data acquisition (Push/Pull) frequency shall be programmable. DCU shall be capable to prioritize control commands.

i) DCU shall support DLMS/COSEM protocol for transfer of DLMS /

COSEM data to MDAS and ensure secure communication to MDAS. Format of DLMS/COSEM is given in Annexe-DLMS/COSEM. The Gateway may be having IPV-6 which transfer the data to HES where it will be converted to DLMS/COSEM protocol.

j) DCU/Gateway shall have internal memory for storing interval data for at least 5 days. It shall be Non Volatile Memory (non-battery backed up) with 10years data retention in absence of power.

k) DCU/Gateway shall support on demand read and ping of individual/group of meters.

l) DCU/Gateway shall push events like tamper, power off etc. to MDAS immediately on occurrence/receipt from field devices/meters.

26.3. Communication

a) The DCU/Gateway also shall have Wide Area Network (WAN) connectivity to the MDAS through digital cellular GPRS/GSM/3G communication connection . In case of GPRS / GSM backhaul, it shall have provision for modem with SIM slot for supporting Dual-band GSM/GPRS module with a valid communication terminal port i.e. RJ45/RS232 for other communication option shall also be provided. DCU/Gateway modem should support GPRS/GSM SIM card. It shall support SIM card from any service provider.

b) DCU/Gateway shall be able to communicate with meters.

c) DCU/Gateway shall periodically monitor meter reads/downstream commands and shall retry and reconnect in case of failed events/reads.

d) After Power Interruption, on restoration of power supply DCU/Gateway shall establish communication with underlying devices as well as upstream application (MDAS) automatically.

e) The retry attempts for meter data acquisition shall be configurable globally or individual meter.

f) DCU/Gateway shall keep record of:

1) No of packet failures
2) Retry attempts
3) Missed periodic reading
4) Failure to connect

g) For each meter up to a period of 3 days and update the same to MDAS periodically.

h) DCU shall be capable to handle data of minimum 50 nos of any type of smart meter. DCU shall be able to acquire and send data to MDAS for full capacity (No. of meters/field devices it is designed for) within a period of 3 minutes. Full capacity of DCU/Gateway is required to be indicated in the offer.

ii) DCU/Gateway shall be able to communicate with the nearest meters at a

distance of at least 50 m, depending on topographical features. For further communication among the meters distance of the other meters with the DCU/Gateway shall not be a constraint as communication of the nearest meters shall be established with other meters through appropriate formation.

j) Remote Firmware Upgrade: The DCU/Gateway shall support remote firmware upgrades as well as remote configuration in order to add new features and functions to DCU/Gateway remotely from the control centre.

k) Configuration of programmable parameters of Smart Meters shall be done through MDAS.

26.4. Testing of the DCU/Gateway

DCU/Gateway shall be tested for EMC and EMI capability as per IEC 61000 for following:

a) Fast transient burst test

b) Test of immunity to electrostatic discharges

c) Test of immunity to electromagnetic HF field

d) The contractor shall provide IP 55 compliance test certificate.

DCU/Gateway functionalities shall ensure AMI/PLM system to achieve performance criteria as specified during performance testing of MDM.

27.0 Repeater:

The repeater enclosure, Fixing arrangement and power supply must be similar to DCU/Gateway enclosure and IP certified. The repeater is basically a RF trans-Receiver in the 865-867 MHz free licensed band and WPC certified as mentioned for the module inside the energy meter.

28.0 Load Control Switch:

Meter shall be remotely settable to support double pole Relay for connection/disconnection:

Phase and Neutral relay Disconnection on the following conditions:

h) Over current

i) Load Control Limit

j) Pre-programmed Tamper conditions (Meter Cover open detection, Neutral disturbance, Magnetic Interference)

k) Disconnect signal from Utility Control Centre such as balance unavailable in case pre-paid facility is availed by consumer. Load Control limits shall be remotely programmable. The reconnection mechanism is as follows:

l) The switch re-connection shall be decided by meter locally. It will try to re-connect the load up to 3times, with 5 minutes interval (not in case of Prepaid meter with limiting balance).

m) If the consumption is still more than the programmed limits, it will lock out and wait for 30 minutes (lock out period).

n) If the consumption is still above the limit, the procedure as defined above shall be repeated.

The brief technical particulars of this Disconnector / load switch are furnished below: -

- Disconnector Specification

S.No.	DESCRIPTION	Requirement
1	Operating Voltage range	130 V to 470 V
2	Operating Current range	20 mA to 120 A
3	Maximum switching power	22 kVA per phase/ per IS 15884 Annex G
4	No. of poles	Double pole in a single relay , f
5	Operation of switches	Simultaneous
6	Utilization Categories	UC2 or better
7	Min. number of operation	3000 (close, open each)

Reconnection mechanism:

Reconnection shall normally be done from MDAS/HES. In case of failure of communication, reconnection shall be possible through HHU locally and the same shall be password protected. For reconnection mechanism a local reset button shall also be provided on the Smart Meter.

Indication of status of relay i.e. Connected / Disconnected should be available on display as well as through communication. Connection and Disconnection should also be logged as events.

In prepaid mode the relay will be automatically be connected from HES when recharged data is available to HES.

29.0 FRP Board:

The FRP (Fibre-Reinforced Plastic) board to be supplied and delivered with each and every meter. The FRP board has to be fixed on the wall of consumer premises where the meter has to be installed. The smart energy meter will then be hanged and fixed on the FRP board firmly. The FRP board must be of electrical Shock proof and fire proof material. The FRP board must be type

tested as per relevant IS and the type test report has to be produced before Testing and inspection from PURCHASER.

30.0 Head End System Hardware and Software:

AMI Implementing Agency has to submit detailed structure of the Head End System including hardware and software.

31.0 SMART PREPAID FEATURES

31.1 The meter shall have a non-volatile memory to retain the vital information in Case of power outages so that data will not lose.

31.2 The credit shall be debited by the meter based on the electricity consumption according to the rate including the fixed charges, minimum charges etc, as defined in tariff configuration.

31.3 The Meter shall be able to deduct fixed charges on daily basis for the full month as per the tariff applicable.

31.4 Visible low credit warning shall be provided with bi-colour LED / LCD indication (preferably Green for healthy zone, else change from green to flickering Red colour) when the credit falls below defined alarm limit.

31.5 An audible sound alarm to be provided inside the meter to alert for any prepaid feature alarm. The alarm can be kept off or on from remote HES or through Optical port locally and must be password protected.

31.6 When the credit reaches to Zero/ Allowable negative balance, the meter shall disconnect the output supply except emergency credit limit of one working Day from 17:30 hours of previous working day / second Saturdays & Sundays, National Holidays, state fixed holidays & next day till 10:00 hrs). It shall give alarm when the credit balance is Rs one hundred (Rs 100.00).

31.7 Meter shall Disconnect the output supply and Restore only when meter balance reach to the amount additional than zero.

31.8 The meter shall disconnect supply after end of such holiday hours. When meter is recharged with new credit, it shall adjust the debited amount first then normal operation shall go on.

31.9 Relay shall be provided in all phases & Neutral element in the meter to let alone fraud and single wire tamper. It shall be bi-stable type latching switch designed and manufactured in accordance with international standard of IEC and DIN EN 61810 part 1 / VDE 0435 part 201 as well as they meet overload and short circuit requirement of IEC and DIN EN 61036 / 61037 & ANSI C12.

31.10 The meter shall have a data downloading facility with smart prepaid meter events like transactions (including the debit / credit balance, consumption particulars details and also Fixed charges, Unit charges, etc. as are applicable for post paid meter connections), alarm, overload, tamper, load survey, etc, through optical port provided with the help of HHU on which the data downloading software is available. The required software shall be supplied by the vendor free of cost.

31.11 The Load survey Data including voltage, current, KWh, KVAh, KVARH Lag, KVARH Lead, Demand (KW/KVA) & Average P.F. shall be available for last 60 power on days both in tabular as well as graphical format and Historical Data shall be available for last twelve months.

31.12 The Tamper Data

32.0 LOAD SURVEY :

The meter should be capable of recording load survey for the following parameters for a period of minimum 60 power on days with 15 minutes integration period.

i) KWH
ii) KVAH
iii) Demand in KW,
iv) Demand in KVA
v) Current – phase-wise
vi) Voltage – Average Voltage

The NVM shall not require any additional battery backup to retain the data in case of power failure, for upto 10 years and the data storage shall be independent of battery backup unit. The life of the RTC battery in circuit condition should be minimum 5 years in case of power failure. It should be possible to transfer this data to base computer software through MRI. The data

so obtained should be displayed in both graphical & numeric form in the BCS. The BCS with all details is to be provided by the supplier at no extra cost.

The following provisions are mandatory for an AIA:

1. **NABL calibration of all the instruments used for testing with sealing of above instruments from NABL authority. Certificates with NABL Logo must be presented at the time of inspection.**
2. **Automatic meter test bench is mandatory with NABL certification as mentioned in 1 above with at least 10 no. meter testing facility at a time with optical scanner.**
3. **BIS certificate to be provided before offer for testing.**
4. **All other type test, GOI or manufacturer certificates related to components, EMC/EMI, WPC etc. are to be submitted before offer for testing.**
5. **The test procedure for accuracy of meter, Checking of Downloaded Data through BCS and to compare it with MDAS data, Test on Tamper, Test on Ultrasonic welding of Meter, Component verification by breaking a meter, Physical Checking of meter, DCU, Repeater and PP Box are to be followed as per the Annexe-I.**
6. **A proto type HES to be created at the time of testing with all the software , DCU, Repeater, SIM card, BCS loaded in a PC/Laptop, HHU to check all the possible communications to report to HES in its MDAS.**
7. **A demonstration on 6 above with meter is to be done at the time of qualifying the bidder technically. If it passes all the criteria at this demonstration then the price BID will be opened.**

The following additional tests shall be carried out in addition to the acceptance tests specified in IS 13779 / 1999 (amended up to date).

A. Acceptance Tests for smart prepaid features

b) Test of credit balance & debit
c) Test of friendly credit hours, start & end time there of
d) Test of disconnect the output supply when credit reach to Zero.
e) Test of reconnect the output supply on providing credit limit.

f) Test of disconnect output supply if load / current exceeded the preset value in the meter.

g) Test of reconnect output supply if load / current falls below the preset value in the meter.

h) Test of visible & audible low credit warning.

i) Test of application of tariff and TOU.

Samples picked up by the inspecting officer for acceptance tests shall be first subjected to 'soaking' at 70 +/- 2 Deg. C for four hours. After normalizing the acceptance tests as stipulated in CBIP (with latest amendments) and IS shall be carried out by the supplier in presence of purchaser's representative. Also the following additional tests are carried out on mutually agreed quantity of meters from each lot offered for inspection.

i) Magnetic induction of external origin (AC&DC).

ii) Tamper & Fraud protection as per Cl. 12.0.

B. Other Acceptance Tests

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

b) Tamper conditions as stated in this specification.

c) Power consumption tests

d) Limits of Error: Limits of variation in percentage error due to change in voltage shall not exceed the values given below.

Sl. No.	Influence quantities	Value of current	Power Factor	Limits of variation in % error for class meter
A	Voltage Variation - 15% to + 10%	Ib Ib	1.0 0.5	0.7 1.0
B	Voltage variation - 40% & +20%	Ib Ib	1.0 0.5	1.1 1.5

e) The meter shall be tested at – 15% and at – 40% of reference voltage as well as + 10% and + 20% of reference voltage and shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.

f) For other influence quantities like frequency variation, the limits of variation in percentage error will be as per IS 13779 / 1999 (amended up to date).

g) The meter shall comply all the tests for external AC / DC (except 0.2 T AC magnet) magnetic field as per CBIP Tech-Report 88 with latest amendments. Moreover the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. If the accuracy of the meter gets affected during the test, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record energy considering Imax and reference voltage at unity power factor. After removal of magnet meter shall be subject to accuracy test as per IS 13779 / 1999 (amended up to date). No deviation in error is allowed in the accuracy as per specifications.

h) Test on Ultrasonic welding to be done for 2 no. meters as a destructive test. The meter cover will be forcibly opened by breakthrough with knife, Screwdriver or similar tools. If the cover detached with cracks at both cover and base then it will be treated as passed. Otherwise it will be declared as failed.

ANNEX –I

TESTS:

i) Type Testing of Meter:

The offered meters should be type tested at any NABL accredited laboratory in accordance with IS 13779 with latest amendments, CBIP Report 325 with latest amendments. The type test report should not be more than 3 (three) years old. A copy of the Type Test results should be enclosed with the offer . If there is any modification in the design/parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

Type Test Certificate from any NABL accredited Lab. shall only be considered.

Type test certificate should contain the following information clearly:

1) Class of accuracy. 2) Meter constant

ii) Acceptance tests :

A. The acceptance tests as stipulated in CBIP / IS (with latest amendments) and shall be carried out by the supplier in presence of purchaser's representative. Lot size, sampling and procedure to be followed for acceptance test will be as stated below .

The following tests shall be carried out on all the meters thus selected at random.

The WBSEDCL's Engineers will witness the various quality control measures adopted for verification of different components of meters and satisfy themselves about the same. They will also inspect the protocol for maintaining the accuracy of the meter testing equipment with reference to the standard at manufacturer's meters testing station.

8. Physical examination of the meters.
9. Non-registration with Voltage along at 70% V ref and at 120% Vref.
10. Starting current at 0.2% I basic Upf.
11. High voltage test.
12. Insulation resistance test.
13. Test of protection for withstanding 433 volt between phase & neutral for a period of at least 10 minutes without any load.
14. Test of endurance up to 150% I max for 2 hours.

Limits of error on all the sample meters at balanced load for both active and reactive (5% to 600% Ib):

1% I basic 1.0 pf. (±2% is preferable but should not exceed ±3%)
2% I basic 1.0 pf.
5% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
10% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
50% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
100% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
200% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead
600% I basic 1.0 pf., 0.5 pf. Lag & 0.8 lead

Limits of error on all the sample meters at unbalanced load for active:
5% I basic 1.0 pf., 0.5 pf. Lag
10% I basic 1.0 pf., 0.5 pf. Lag
50% I basic 1.0 pf., 0.5 pf. Lag
100% I basic 1.0 pf., 0.5 pf. Lag
200% I basic 1.0 pf., 0.5 pf. Lag
600% I basic 1.0 pf., 0.5 pf. Lag
Test of meter dial at 200% I basic, 0.866 pf. Lag and 0.8 pf lead.
Test of meter constant for one unit at 200% I basic, 0.866 pf. Lag.
Power loss on voltage & current circuit.
Repeatability of error test at 5% I basic Upf & 100% I basic Upf.
The maximum divergent should be less than 0.1(Utility specific requirement)

If anyone of the meter fails on any of the above tests, the lot will be rejected.
Further testing for 1 No. sample meter will be carried as follows:
Magnetic induction of external origin (AC & DC).

4. Electro Static Spark Discharge of 35KVp
5. Tamper and Fraud protection as per Clause 12 (Anti-tamper feature) of our specification.
6. Dry –heat test as per clause 12.6.1 of IS: 13779/99.

At least one sample selected from any lot of the meters offered for inspection will be sealed by us and handed over to the supplier for testing at NABL accredited laboratory. Presence of purchaser's representative during dry heat test at NABL accredited laboratory is not required. But in the test report meter Sl. No. & meter body seal nos. is to be mentioned.
• Physical verification of internal components as per given ***component list***.
If the meter fails on any of the above test, the lot will be rejected. Facilities/arrangement for conducting ageing test should be available with the manufacturer.

iii) Retesting after delivery:

WBSEDCL will carry out re-testing of the supplied meters at their laboratory. Re-testing of the supplied meters will be conducted on sample meters collected from different stores of the consignees as per the procedure followed for acceptance test (except dry heat test & shunt test) during inspection & testing of the supplied meters at manufacturer's works. Re-testing of the supplied meters will be completed within one month from the date of receipt of meters at different stores. Date of re-testing of meters will be intimated to the supplier for witnessing testing of the meters. In case the meters are not in order as per our observation during inspection and testing of the supplied meters, the lot will be declared defective and in that event meters supplied are to be replaced by the manufacturers free of cost including free transportation from the site to their works and back. The replaced meters are to be offered for inspection & testing and Acceptance test of will have to be carried out by the supplier in presence of purchaser's representative.

iv) Routine Tests :

Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report-325 and after sealing of the meters, the manufacturers will submit the routine test report of all the meters as well as a statement showing seal Sl. Nos. against each meter, Sl. No. of offered lot in soft copy (MS WORD or EXCEL format), to the Chief Engineer, DTD, along with offer letter for acceptance test.

v) TEST FACILITIES:

The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipments/ instruments.

NOTE: The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchaser's representative

The manufacturer shall have the following testing facilities to ensure accurate calibration :

10. AC high voltage test
11. Insulation test
12. Test of no load condition
13. Test of Starting condition
14. Test on Limits of error
15. Power loss in voltage and current circuit
16. Test of Repeatability of error
17. Test of meter constant
18. Test of magnetic influence

Component Specification

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type. All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. no.	Component Function / Feature	Requirement	Make / origin
1	Current Element	E-beam /spot welded shunts shall be provided in the phase element and C.T. in the neutral. Alternatively, both the current elements (phase & neutral) shall have Shunts with proper isolation	Any make or origin conforming to IS-2705
2	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type along with the ASICs.	USA :Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, Texas Instruments, Teridian, Japan: NEC, Freescale, Renesas, Holland: Phillps
3	Memory chips	The memory computing chips should not be affected by the external parameters	USA: National Semi Conductor, Atmel, SAMES, Texas Instruments,Teridian,

		like sparking, high voltage spikes or electrostatic discharges.	ST, Microchip, Japan: Hitachi, OKI, Renesas, Freescale, Holland / Korea: Phillps
4	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70o.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range. Singapore	Singapore: Bonafied Technologies, Korea: Advantek, Japan : Hitachi, SONY, Hijing, Truly Semiconductor. Chaina: Tianma
5	Communication modules	RF and NIC card inside meter for com from meter to DCU/Gateway and GSM/GPRS/3G cellular network from DCU/Gateway to HES for single phase meter and for 3 phase meter it will be GSM/GPRS/3G cellular network from meter to HES.	Any national or international make with proven in any project in India .
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, Texas Instruments, HP, Agilent, Avago Japan: Hitachi, , Germany /USA :Osram Germany: Siemens, Holland / Korea: Philips, Taiwan: Everlight,
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	As Specified

		connections	
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: Atmel, Philips, ST, National Semiconductors, Onsemi, Texas Instrument, Japan: Toshiba, Fairchild, Murata, Hitachi.EPSON. Ligitec, Panasonic OKI, EPCOS, Rohm, Freescale Germany: Siemens. Korea: Samsung.
9	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.	
10	Battery	Lithium / Lithium-ion /Ni-Mh with guaranteed life of 10 years	Renata, NationalPanasonic Varta, Tedrium, Sanyo, Tekcell, Tadiran, Duracell, Mitsubishi, Sony, Maxell, Elegance.
11	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Dallas, Atmel, Motorola, NEC, Renesas, Texas Instruments, ST, Microchips, Epson Holland / Korea: Philips, Japan: NEC, OKI, Hitachi, Mitsubishi, Freescale