TECHNICAL SPECIFICATION FOR SUPPLY OF SINGLE PHASE KEYPAD PRE PAYMENT METER AND VENDING / TRANSACTION SERVICE

1.0 INTRODUCTION

This documents covers technical specification of keypad based pre payment system for single phase consumers. Key pad system must be capable of configuring Slab as well as TOD tariff with appropriate combination.

- The requirements of the online Vending/Transaction system to be provided for the keypad prepayment metering system are also covered in the scope.
- Separate display unit/split unit shall be provided with each meter.
- The display unit shall have provision to enter the encrypted code in the meter.
- The system should be powered by web based vending system by integrating with the AP_PDCL website and web based vending will be done using the payment gateway of AP_PDCL only.

This system required where money should be transferred from a point of sale (ERO/csc/ icsc) to a consumer meter by means of an encrypted numeric printed token secured by Triple Data Encryption System(TDES) which should be transferred to meter through Meter Keypad / In Home Display keypad / RS232 port / GSM Modem. The prepayment system should be managed centrally by total secure management system with data contained in numeric encrypted codes which are meter specific.

The encrypted code should contain relevant information regarding consumer database, tariff, recharge amount arrear, rebate etc. and stored in the meter memory. This information should display on Meter & In Home Display. The Meter & the In Home Display should have keypad for amount transfer. The meter should design in single box with measuring element, dual latching/Bistable relay for phase and neutral.

The "In Home Display" should be in the form of LCD / LED display which displays multi-information. The meter & In Home Display should have credit status warning on meter LCD display / LED and audible alarm for low credit warning and overload.

2.0 SCOPE

a) This specification covers design, engineering, manufacture, testing, inspection & supply of **A.C. Single phase, two wire solid state (static) fully electronic energy meters** of accuracy **class 1.0** keypad prepayment meters with split unit & provision for TOD (Time of Day) tariff. The current rating of Meter is 5-**30 A**, with **backlit LCD display** for **240 Volt** systems. The meter should be capable of recording & displaying energy in KWH/Kvah & 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.

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 AP-DCL, who will interpret the meanings of drawings & 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 mentioned in this specification and / or the commercial order or not.

c) Consumer database should be defined with appropriate tariff category & credit / debit limit before commissioning the meter at consumer premises. After that token should be generated to energise the meter. The database & tariff configuration should be prepared by our authorized person who shall be adequately trained by the supplier. Meter recharging token should be generated by any electricity revenue collection center where internet connection is provided by the utility. There should not be any limitations of machine to generate token.

d) The original manufacturers of LT A.C. static energy meters shall only quote against this tender. In case of foreign manufacturers their authorized agent may also quote provided that they should be registered vendor and shall have all the testing facilities in India. They should also produce the documents authorizing them as agents, in India.

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.

3.0 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 the day of floating 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 & 2.0
2	CBIP - 304	Specification for AC Static Electrical Energy Meters
3	IS 12346 (1988)	Specification for testing equipment for A.C. Static Electrical Energy Meter (latest amendment).
4	C.E.A. Regulation No. 502 / 70 / CEA / DP&D dt 17/03/2006	Central Electricity Authority (Installation & Operation of Meters) Regulation, 2006.
5	IS 14434 (1998)	Polycarbonate Moulding & Extrusion Materials.

Note: All kinds of tests which are required as per mentioned standards shall be carried out.

4.0 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	:	55^0 C
ii)	Minimum Ambient Air Temperature	:	(-)10^0 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

5.0 SUPPLY SYSTEM

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

6.0 POWER FACTOR RANGE

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

7.0 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 $\pm$5%

8.0 ACCURACY

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

8.2 Maximum error limit at 1% I_b, UPF should not exceed +/- 2%.

9.0 POWER CONSUMPTION

9.1 **Voltage Circuit :** The active and apparent power consumption in the voltage circuit including the power supply of meter including split unit at reference voltage, reference temperature and reference frequency should not exceed 1.5 Watt and 8 VA respectively.

9.2 **Current Circuit :** The apparent power taken by current circuit at basic current, reference frequency and reference temperature should not exceed 1 VA.

10.0 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.
Running at no load: When 70% & 120% voltage is applied and no current flows in the current circuit, the test output of the meter should not produce more than one pulse.

11.0 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 clause 5 above.

12.0 GENERAL & CONSTRUCTIONAL REQUIREMENTS

12.1 Meters should be designed providing reinforced insulation 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

12.2 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 shall be of advanced technology.

12.3 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/ translucent cover with transparent viewing window, for easy reading of displayed parameters, and observation of operation indicators. The meter base may or 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.
The meter cover should be sealable to the meter base with at least 2 nos. seals.

12.4 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 hinging arrangement or ETBC with a centre U-cut without hinging arrangement for proper wire termination is also acceptable. The terminal block should be made of high grade non-hygroscopic, fire retardant, fire resistant, glass reinforced poly-carbonate with terminal holes of minimum dia 5.5 mm and should be suitable to accommodate the insulation of the conductors, meeting the requirement of IS 13779 / CBIP 304. The minimum center-to-center distance clearance between adjacent terminals should be 13 mm.
Terminal cover should have provision for sealing with at least one seal.

12.5 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.

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

12.7 **The meter should be capable of providing phase to neutral protection up to 440V for 10 minutes.**

12.8 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 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 be of tinned / nickel plated brass material.
The terminals should be capable of withstanding a current of 150% of Imax for two hours, continuously.

12.9 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.

12.10 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.

12.11 The meter should be fitted with **C.T**. **or SHUNT** for measuring current in the phase element(for accurate measurement). 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.

12.12 The meter cover should be permanently fixed to the meter base by using ultra sonic welding 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 / instruments / 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 such tamper evident features. However, sealing with commonly available adhesives will not be accepted.

12.13 If the top cover is removed, meter should have a indication in its display even in power off condition and it should be remain until reset the tamper through BCS. Display indication also to be provided while any tamper (like current reversal, earth load. Magnetic influence etc.) occur and should remain until reset the tamper through BCS. Here display means display of meter & IN HOME DISPLAY unit.

12.14 Sealing Arrangement: The sealing screws used for the meter cover shall be fixed upside down/sealing from top in absence of sealing screws provision of holes on meter body should be kept for sealing purpose.

The sealing screws provided for meter terminal cover should be Tinned Brass or Nickel platted steel.

13.0 TAMPER EVIDENT FEATURES

The meter should have the following tamper evident features and should record & register forward energy accurately under the following conditions :

i) Meter should record energy in forward direction irrespective of direction of current.

ii) Meter should record energy correctly during the conditions iii) and iv).

iii) 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.

iv) A part of the load is returned to a local earth and the other part is returned to the meter.

Note:

a) D.C. injection test will be carried out in three different loads ranging from 5A to 30A and chopped A.C. injection test will be carried out in five positions of regulators in three different loads ranging from 1A to 30A.

b) In case of recording of energy at Imax during D.C or chopped A.C injection in neutral, tamper events should be logged as DC injection or AC injection.

c) the meter is immune / records energy within error limit of ± 4% during

D.C or chopped A.C injection in neutral or any other neutral disturbance, tamper events should be logged as Neutral Disturbance.

vii) Meter should record energy with maximum error of ± 4% even in absence of neutral wire not connected at incoming & outgoing, i.e. single wire operation. In such condition Meter should start recording energy at 1.0 Amps.
Note: Test will be carried out in different loads ranging from 1.0A to 30A

viii) 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. Tests in this respect will be conducted by using commonly available devices and the test shall be performed for 10 min. Before & after the spark discharge test, meter accuracy shall be verified and be with in permissible limit. If the spark is beyond the 35 KV, meter output supply shall be disconnected to protect meter internal circuitry and stamps logged in meter NVM.

The meters shall be immune to tampering through application of external magnetic fields at least up to 0.5 Tesla (DC) and 0.2 Tesla +/- 5% (AC) as per CBIP-304. The magnetic test should be conducted on all three phases.

On application of magnetic interference beyond 0.2 Tesla, the meter shall record energy at 150% Imax, rated voltage and UPF as per CBIP-304. The meter is expected to be immune to such interference and this clause is applicable when interference level is beyond immunity offered by the meter. The vendor has to state the level under which meter records energy as stated above.

The meter should offer a link less design i.e. there is no isolation link provided between the current and voltage circuits and hence there would not be any possibility of tampering with the same. During current reversal meter should record energy in forward direction irrespective of direction of current and Earth load tamper should be recorded as current imbalance.

The duration of tamper before it is logged should be a factory programmable. But it should not be more than 10 min.

Tamper logic will be checked during testing.

If top cover is removed / open, meter should have indication in its display.

14.0 DISPLAY

14.1 The measured value(s) should be displayed on a Liquid Crystal display (LCD) register. The height X width of the digit should be minimum 10 X 5 mm. The KWh/Kvah energy registration should take place with 6+1 complete digits. The display should have backlit capability for easy reading. When the LCD is placed at a constant temperature of 65 deg C for a period of 30 minutes in operating condition and 80 deg C for 30 minutes under de-energized / storage condition, it should not get deformed.
The LCD should be of STN/TN (Super Twisted / Twisted Pneumatic) type with display size area of at least 55 X 14 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 & down from eye level.
Backlit in IHD is optional.

14.2 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.

14.3 The register should be able to record and display starting from zero, for a minimum of 2500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.

14.4 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.

14.5 There should be two modes of information display, these are Normal Display & Engineering Display.

15.0 DISPLAY SEQUENCE

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

15.1 Normal Display Mode :

The following parameters should be displayed using the keys (or) combinations of keys on the key pad.

1. Real Time & Date
2. Cumulative Active energy (forwarded) reading (kWh & Kvah)
3. Switch operation counts
4. Credit balance in INR
5. The days left based on the last seven days average consumption
6. Consumption of last month.
7. Present slab rate in Rs/ Kwh/Kvah
8. Maximum demand along with date & time (current month) on display & last 6 months in memory
9. Average Power factor for current month on display & last 6 month in memory
10. Instantaneous current , voltage, p.f., KW etc.
11. TOD wise Energy for last 6 month in memory LCD test and Tamper counts are optional.

Any other value added display is acceptable.

Each parameter should be on meter display for 10 seconds and the time gap between two Normal-cycles should be 120 seconds.

The meter should also be capable of offering a resolution of 4 digits after decimal & 2 digit before decimal for the high resolution KWh/Kvah display and 2 digits after decimal & 4 digits before decimal for the high resolution Wh display.

Permanent display with Normal mode should be provided like:

a. Supply indication: This should be available on meter in the form of LCD/LED, which displays the default parameter when meter is powered ON.

b. Relay Status: This must be displayed in meter/IHD auto display cycle.

c. Current reverse/magnet influence/earth load indication (if condition occurred): This should appear on meter LCD in default display cycle as “TAMPER” or by LED.

15.2 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:

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

15.3 Display unit:

- ❖ The Meter shall be supplied with a separate display unit
- ❖ The display unit shall be powered up from the meter
- ❖ The display unit shall have a LCD display similar to that of the meter
- ❖ The display unit shall have a key pad to enter the code. The keypad should be similar to the keypad available on the meter
- ❖ The display unit shall have a RJ11 connection port to connect to the meter
- ❖ Maximum distance between the display unit and the prepayment meter shall be 100 meters.
- ❖ The display unit & energy meter shall be connected using a 4 wire connection cable (similar to telephone cable)
- ❖ The display unit shall have a buzzer to generate alarm signal in case of low credit and overload.

15.4 Key pad

a) The Keypad buttons should have numbers, which should clearly visible and resistant to wear. The layout of the numbering should be same as that used used on standard telephones for numbers 1 to 9 and buttons as '#' ,'*' and '0'. Button 5 has physical identification of raised printing to aid consumer having poor sight.

b) The codes encryptions and decryption should be carried out by triple DES using an internationally recognized standard.

c) The meter should permit a time delay up to 15 seconds between two key strokes while entering token for recharging. Error message should be displayed if delay time is more than 15 seconds.

d) Account balance" should be displayed regularly on IN HOME DISPLAY unit with current date and time with sleep mode. Cummulative KWH/Kvah in IHD is optional.

15.5 Key pad Display : Key Pad display is at the discretion of Manufacturer but the information of the respective keys on the key pad will be available to each consumer in the form of handout.

The meter key pad display buttons should display following parameters;

Key "1" - Based on the previous week's consumption, the meter calculates the approximate number of days left before the credit ends.
Key"2" - Display the consumption data of the last day, last week, the last six months in INR.
Key"3" - Display price applicable for each slab and slab rate-wise energy consumption.
Key"4" - Display latest five vends code which entered into meter to credit it.
Key"5" - Display cumulative credit amount, cumulative fixed charge, daily fixed charge, Meter serial number & sanctioned load.
Key"6" - Display instant load in KW, Voltage, Current (both Phase & Neutral), p.f.
Key"7" - Display Current month MD along with last 6 month's MD and Load Factor.
Key"8" - Display Current month average power factor along with last 6 month's p.f.
Key"9" - Display monthly consumption in rupees.
Key"0" - Display Date, Time & emergency credit limit value in INR.
Key"#" - Display 'Authenticated Billing Code'
Key "*" - are left for manufacturer's choice of operation.

The meter should display the atleast 20 digit authenticated meter reading code on key #. The full 20 digit token shall contain the following frozen value at midnight (00:00 Hr) of month end

- 5 digit cumulative KWh/Kvah energy register
- Date of frozen data
- Credit balance, it may be positive or negative
- The tamper flag, which only indicates whether there is any tamper or not.

16.0 MAXIMUM DEMAND REGISTRATION & RESET

Meter should continuously monitor & calculate the average maximum demand for each demand interval time of 30 minutes (sequential) 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 of each calendar month.

The integration period should be set as 30 minutes, on real-time basis.

The active forwarded energy, maximum demand in kW and average PF should be recorded and should be available for a minimum period of last 6 months.

16.1 DATA STROAGE

Consumption details of previous 6 months in term of Rupees must be available on display or in memory.
Time of use of MD is optional.
The meter shall have provision recording parameter such as V, I, KWh/Kvah etc. for every 30 min.
These parameters should be downloadable through CMRI and remotely through any wireless/advanced technology compatible with BCS.

17.0 TIME OF USE / Time of Day MONITORING

- **The meter should offer the capability of time of use monitoring for energy. Minimum 6 registers should be capable of being configured for TOD monitoring for Peak / off peak hours. Time slots will be supplied before execution of supply the meter. Hrs. In case of any change of Time slots 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. From the above it is clear that TOD timings is programmable and it should be possible to change the time slot / period for TOD recordings through the CMRI unit or through vending station.** TOD Timings in six zones by default shall be as given below. However software has to be provided to change the TOD zones whenever required.

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

18.0 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..

19.0 COMMUNICATION PORT

The meter should have a RS 232 port for data communication with CMRI and Laptop. Adequate sealing provision should be provided. DLMS open protocol shall be used for communication.

20.0 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 and Laptop and downloading instructions from base computer software to CMRI and Laptop.
The BCS should be with latest version of Windows platform based and copy righted.

The data stored in the meters memory including defraud energy should be available on the BCS

The vendor should also supply the necessary CMRI and Laptop software.

The bidder has to supply the Meter Reading protocol (API). 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. It should not be possible to alter date in the meter by-passing commands from the CMRI / Laptop or through vending station.. For alteration of RTC time, change of TOD timing, Billing parameters, etc it should be possible to perform this functions through CMRI but only through authenticated commands sets by BCS after scheduling for particular meter sl. nos. No alternation, change should be possible through authenticated commands sets by BCS without scheduling of meters. Moreover, no alternation, change should be possible using CMRI only, i.e. the control has to be with the BCS or through vending station.

For every 15 nos. meters, one chord is to be supplied for communication between Meter and CMRI.

21.0 MARKING OF THE METER

The marking on the meter should be in accordance with relevant clauses of IS 13779.

The basic marking on the meter nameplate should be as follows (all other markings as per IS 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) 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 AP-PDCL"
m) Purchase Order No. & Date
n) Guarantee period.
o) BIS marking
p) Place of manufacture

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. Information of the Tamper should be available on the meter LCD display/LED.

The relation between test output and the indication on display should comply with the marking on the name plate (imp per KWh)

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 VENDING STATION & IN HOME DISPLAY

The Vending system should be "web based Vending System" for easy token generation by any Revenue collection center.

Meter must accept the encrypted token/vending code generated by the vending machine either by means of keying in the code through keypad or direct transmission of encrypted code via a communication network viz. GSM/CDMA/ GPRS/PSTN.

Customer Interface unit should have high resolution graphic/ normal LCD display which should be user friendly and provides a host of information to the consumers in tabular format with single key.

26.0 PRE PAID FEATURES

Token and Credit Amount: The online single token could be generated up to 0.5 / 1.0 lakh INR and the same debit limit should be provided into the meter.

Tariff Structure:

a) The Tariff should support both instant and delayed tariff publication and activation for Slab & TOD tariff.
b) The tariff should activate instantly and update as soon as token punched into the meter.
c) The delayed tariff should activate any date of the calendar month.
d) Meter should be capable for both Slab and Time of day (TOD) tariff.
e) Slab and TOD boundaries should be defined by midnight in desired range.
f) Meter should support maximum of 8 slab boundaries with maximum of 8 rate registers for slab tariff.
g) Meter should supports maximum of 8 rate registers with maximum of 4 non overlapping time zones in a day.
h) Consumer type, Category type should be mentioned in desired alphanumeric character.
i) The parameters like slab/TOD boundaries, rates, fixed charges etc. are shall programmable as per utility's tariff structure.
j) Using the on line vending system, it will be defined separately by the utility at the time of supply. If the consumer consumes electricity equivalent of amount less than the minimum charge then at the end of the billing period the meter shall deduct the difference of the minimum amount & the monthly consumption (amount).
k) Fixed charges should be sum of meter rent and any other fixed charges for whole month and it should be deducted from the balance credit amount on daily basis to avoid any abrupt fall in credit and consumer inconvenience.
l) Energy duties (Tax) facility should be provided on the basis of unit rate of consumption in percentage and the same should be integrated in rates shown on display.
m) The meter should be configured for KWh/Kvah billing through token only.
n) The amount should be deducted after completion of one KWh/Kvah to avoid fractional amount in paisa.
o) Using the back-office software application the utility shall have ability to remotely program individual or multiple meter points, including tariff plans and configuration through MRI and Web.
p) A manual should be supplied above token value of Rs 1000 where all these calculation in terms of tariff configuration & amount deduction procedure will be clearly provided for consumer satisfaction.

27.0 SALIENT FEATURES:

a) The salient features of the meter should be as given below;
b) A key pad should be provided on meter front cover for inserting token no and to energise meter and view display details of various parameters provided by respective key.
c) Graphical consumer interface unit (IN HOME DISPLAY) should be provided to access meter from consumer premises. IN HOME DISPLAY should have telephonic style keypad to energise the meter and see display details by respective key.
d) The meter should have legible LCD with starburst display for displaying alphanumeric characters and information like Total credit amount, credit balance, cumulative KWh/Kvah. Slab details and their rates, current MD with occurrence date & time.
e) The meter should be tested, calibrated and sealed at production plant before dispatch. Further no modification of calibration is possible at site by any means what so ever.
f) The meter should display message on accepting valid token transaction and on rejecting invalid token transaction with an additional sound.
g) The meter should capable to accept numeric token via keypad or through any wireless technology and should credit the purchased amount to the meter. This credit should be added to the existing balance available in the meter.
h) The credit should 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.
i) The meter & In Home Display should have credit status warning on meter LCD display / LED and audible alarm for low credit warning and overload.

j) An audible low credit warning should be provided to make sound after every half hour duration for 30/120 second till the alarm is acknowledged by consumer by pressing either meter or IN HOME DISPLAY unit.
k) When the credit goes to zero, the meter should disconnect the output supply & should reconnect only if emergency credit limit is provided to consumer or meter charged with a new token which has additional amounts greater then zero.
l) The meter should capable to configure for emergency credit limit so that some defined amount provided to consumer after zero balance. After this defined amount meter should disconnect the output supply and restore only when meter balance reach to an amount greater than zero.
m) The meter should have a facility of load limit configuration, which should be programmable. An alert shall appear in the in home display unit besides getting recorded as tamper in the meter.

n) Friendly credit facility must be inserted in the meter memory. The meter should not be disconnected consumers supply even if their credit falls down to emergency credit limit during night hours on weekly – off (Sunday) or pre-defined public holiday. It must be programmable by the utility through MRI and wireless technology. The meter should disconnect supply after end of such friendly hours and days. When meter is recharge with new credit it should adjust the debited amount first and then normal operation goes on.

o) Relay should provided in both phase & neutral element in the meter to let alone fraud and single wire tamper. It should be bi-stable type latching switch designed as per inter national standard.

28.0 FUNCTIONAL PARAMETERS

a) Consumer database, Tariff, sanction load, debit credit limit etc. should transfer to meter memory by the initial token transaction. Any modification in consumer profile should be updated through subsequent vending transactions.

b) Fixed charge should be deducted on daily basis & irrespective of the consumption. It should be deducted even after disconnection of supply and stored as negative value which should be adjusted in the next vending transaction.

c) Consumption charge should be deducted as per the current tariff structure.

d) Emergency credit limit should be available as per the current sanctioned load.

e) Vending codes should be meter specific & could not be used by another meters. This code can be reused if lost but the same token can't be reused.

f) Message facility should be provided for individual consumer or for all consumers linked with the system. The activation and expiry date of the message should be defined as desired. The message should be intimated to consumer till validity period. After expiry of date, it should be ineffective.

g) Meter configuration as well as consumer database details should be uploaded into system with a single click.

h) If meter become defective and sent for service, tracing system should be available with mode of conveyance & dispatch date with proper documentation. The separate report could be generated if required to analyse.

29.0 Vending Machines specification along with related software :

Web based vending software system : The vending system shall be "Web based vending system" for easy operation, token generation by any POS machines. The online system shall be integrated with website of EPDCL and payment gateway. This will enable the consumer to generate recharge token by making payment online through credit card or net banking. There shall not be any limitation of POS/client machine (PC). The web based vending system shall be able to generate credit tokens for multiple makes of meter. The unlimited user licenses for vending applications shall be provided during the course of tenure of contract (i.e., guarantee and AMC period). Necessary modifications and up gradations of the software is sole responsibility of the vendor and it shall be free of cost during guarantee period & AMC period. The AMC shall be applicable after guarantee period is over, the offer shall include this. The AMC shall be for further five years renewable every year after guarantee period.The server shall be rack mountable type.

30. Prepaid Metering, Billing & Collection System Requirement :

(a) This section specifies the requirements of the prepaid metering, billing and collection system for currency based prepayment metering solution.

(b) The meter shall work on the latest currency transfer keypad technology supported by an online prepaid metering, billing and collection system. The keypad technology is future proof, cost effective and in this communication age, enables consumers to buy electricity over the multiple vending options like AP_PDCL billing centers, AP_PDCL website, through third party POS providers and SMS based vending. The software shall be web based and browser based solution; therefore the same shall run on any PC without any footprint. Additional options shall also be supported which shall need the discussion with the AP_PDCL as per the mutual agreement i.e., vending through mobile phones, IVR, bank ATM, retail vending stations etc., thus provides multiple options to buy electricity.

(a) The vending station shall be placed at the billing station of AP_PDCL for which necessary office space, electricity etc., and furniture for this system shall be provided by AP_PDCL. Cash shall be collected by AP_PDCL staff; upon the advice of the designated staff the vend terminal / personal computer shall generate a token to transfer the credit to the energy meter.

Adequate back up power in the form of suitable UPS with standard back up shall be provided at each vending station.

The vend codes shall be issued from the online prepaid metering, billing and collection system. It shall be possible to provide various vending options like SMS based vending, web based vending and POS terminals based vending. This system will produce the MIS reports and help to define the customers in the database as mentioned in this specification. The steps of vending shall be as under :

(b) On receipt of the vend request the system shall have a provision to ascertain the identity of the consumer. The keys to identify the consumer shall be the meter serial number or consumer number.

(c) The vend terminal shall send the request to a central database that shall authenticate the transaction and generate an encrypted code.

(d) The consumer shall pay the money at the vend terminal, this information when fed to the vend terminal shall be sent to the central database that shall encrypt the token using Triple DES encryption algorithm.

31. Prepaid Metering, Billing & Collection Software :

The prepaid metering, billing and collection software shall be supplied by the successful vender for implementing prepaid metering solution in AP_PDCL. The solution shall be web based and shall have capability to interface with the central database and produce the management reports which shall be decided mutually with the successful bidder. It shall manage all administrative data, including settings of system accounts, tariffs, meter and consumer data. It shall also provide reporting system for system analysis. The Enterprise software solution shall be provided to AP_PDCL with unlimited user licenses. Also the software license shall support unlimited consumers and meter data management. Various tasks that shall be performed from the prepaid metering, billing and collection software are outlined below.

1.0 Consumer Database management
1.1 Entry of new consumers and their details
1.2 Integrate with the Existing EPDCL's consumer database for updating the required information in both the systems.

2.0 Meter Database Management :
2.1 Entering the pre paid meter details

3.0 Tariff Management
3.1 Tariff structure definition
3.2 Rate price definition
3.3 Tariff category
3.4 Tax percentage
3.5 Fixed Charge value
3.6 Slab reset period
3.7 Tariff change administration

4.0 Limit Parameter management
4.1 Define load limit
4.2 Current limit value
4.3 Emergency credit
4.4 Calendar Management : Public Holidays, Sundays etc.,

5.0 Debt (previous charges) Management :
6.0 Transaction management :
6.1 Cash vend transaction
6.2 Retained credit transaction
6.3 Refund Money transaction
6.4 Previous Charge Transaction
6.5 Integration with payment gateway

7.0 Reports :
7.1 Debt collection and outstanding report
7.2 Tax and duties accounts report
7.3 Customer's Vend Report
7.4 Web enabled.
7.5 Export of data in CSV format.

8.0 Message Management
8.1 Entry of system message
8.2 Entry of Customer Specific Messages
8.3 Entry of Predefines Messages

9.0 User Security Management
9.1 Group rights definition
9.2 Entry of system users and allocation of group rights

32. Security Aspect

The vending system shall be a sophisticated system with reliable security features.

(a) The token recharge created for particular meter with the defined tariff shall not be used for any other meter.

(b) The meter shall accept the valid token only once.

(c) The token shall not be reusable.

(e) The token recharge shall be re-issued in case of losing the same. Necessary charges shall have to be bourned by consumer.

(f) Whenever a tariff change takes place the token shall not accept new vends without entering the new tariff.

General Requirements

1. QUALIFICATION REQUIREMENT

This bidding is open for Manufacturers only who provide satisfactory evidence:

a) Bidder shall have ISO 9000:2001 certification.

b) The bidder shall be an original Indian Electronic / static key pad technology based energy prepayment meter manufacturer and shall have designed, manufactured & tested experience for at least five years in manufacturing of prepayment meter.

c) The bidder shall have valid BIS Certification of relevant ISS; type test of the same shall be submitted at the time of submission of offer.

d) The bidder should have supplied at least 5000 meters installed and working in one or more SEBs / Power Utilities in the country. In support, copy of orders received from Electricity Boards/ Power Utilities and performance certificate should be enclosed.

e) The complete system with all related devices and software with minimum 10 vending facilities should be in working / running since last two years.

2. GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed Technical Particulars and data, appended with this Specification. If the bidder desire to furnish any other information(s) in addition to the details as asked for, the same may be furnished.

3. TECHNICAL DEVIATIONS :

Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

4. 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 1988 with latest amendments. The type test report should not be more than 2 (Two) 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. which may affect the characteristics as well as parameters of the previous type tested 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 report for material identification of meter base, cover & terminal block shall have to submitted with offer.

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

Type test certificate should contain the following information clearly :

1) Type of display i.e. whether counter is mechanical type or LCD.
2) Class of accuracy.
3) Meter constant

ii) Acceptance tests :

A. The acceptance tests as stipulated in CBIP304 / 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 for 10 nos. meters selected at random.

- The AP_PDCL's Engineers shall witness the various quality control measures adopted for verification of different components of meters and satisfy themselves about the same. They shall also inspect the protocol for maintaining the accuracy of the meter testing equipment with reference to the standard at manufacturer's meters testing station.
- Physical examination of the meters.
- Non-registration with Voltage along at 70% V ref and at 120% V ref.
- Starting current at 0.2% I basic Upf
- High voltage test.
- Insulation resistance test.
- Test of protection for withstanding 450 volt between phase & neutral for 10 minutes.
- Test of endurance up to 150% I max
- Test of meter constant and meter dial for one unit at 200% I basic, 0.866 pf. Lag.
- Power loss on voltage & current circuit.

Further testing for 3 Nos. sample meters will be carried as follows:

- Repeatability of error test at 5% I basic Upf & 100% I basic Upf.
  The maximum divergent should be less than 0.5%..
- Magnetic induction of external origin (AC & DC).
- Electro Static Spark Discharge of 35KV
- Tamper & Fraud protection as per Clause 12 (I to vii) (Anti-tamper feature) of our specification.
- Injection of DC pulse (low frequency) in the neutral.
- 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.

- Shunt test by applying 100 Amps continuous load for minimum two hours for verification and conformation for quality of shunt & its E-beam welding.
- Physical verification of internal components.

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 :

AP_PDCL 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 304 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 CGM (P&MM) 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 purchasers representative.

The manufacturer shall have at least the following testing facilities to ensur accurate calibration :

- AC high voltage test
- Insulation test
- Test of no load condition
- Test of Starting condition
- Test on Limits of error
- Power loss in voltage and current circuit
- Test of Repeatability of error
- Test of meter constant
- Test of magnetic influence

5. INSPECTION :

The purchaser may carry out the inspection at any stage of manufacture. The manufacturer shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase. The Bidder shall provide all reasonable facilities without charge to the inspector, to satisfy him that the equipment is being furnished in accordance with this specification.

The supplier shall keep the purchaser informed in advance, about the manufacturing programme for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items. The supplier shall give 15 days for local supply / 30 days in case of foreign supply advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

The purchaser reserves the right for type testing of any meter & meter casing etc. from any of the offered lots, received at any destination stores.

6. SUBMISSION OF SAMPLE METER

The bidder shall submit his sample Meters in sealed casing / carton along with relevant meter documents, on any working day, from 11.00 A.M. to 04.00 P.M. on weeks days & from 11.00 A.M. to 01.00 P.M. on Saturday within the specified period of submission of tender documents latest by 04.00 P.M. on the last day of submission of bid to the Office of the Chief General Manager (P&MM) of the respective DISCOMs.

The bidder will be given a receipt, jointly signed by the bidder and DTD officials, mentioning the samples and papers submitted by the bidder as per check list.

a) While submitting the samples and required documents, the bidder has to submit two numbers of sealed meters as per the specifications stated herein before, without the welding of the meter base and cover and body screw caps and BCS (as per specification).

b) They should also submit one prototype of meter base and cover (with body screw caps) properly welded.

c) The date of testing of sample meters will be intimated to the bidders by CGM(P&MM) and on the date of testing of sample meters of a particular bidder, he shall come prepared with the following :

- BCS (as per specification)
- CMRI compatible with BCS and loaded with CMRI software and laptop compatible with BCS.
- Any other accessories required for observing the performance and capabilities of the meters.
- Operating/threshold value at which the meter will record energy as per specified limits of errors and also logic at which meter log tamper at different tamper conditions.

During such testing, other bidders will also be allowed to witness the testing and only one representative of each bidder with proper authorization letter from his organization will be allowed to witness sample testing of a particular bidder.

If any bidder send his representative to witness sample testing of other bidders, his representative will have to be present till completion of sample testing of a particular bidder and test reports are to be signed by his representative.

7. QUALITY ASSURANCE PLAN :

The design life of the meter shall be minimum 10 years and to prove the design life the firm shall have at least the following quality Assurance Plan: -

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.
- Power supplies used in testing equipment shall be distortion free with sinusoidal wave- forms and maintaining constant voltage, current and frequency as per the relevant standards.

During the manufacturing of the meters the following checks shall be carried out.

i) Meter frame dimensions tolerances shall be minimum.
ii) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.

The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

- Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials.
- Information and copies of test certificates in respect of bought out accessories.
- List of manufacturing facilities available.
- Level of automation achieved and lists of areas where manual processing exists.
- List of areas in manufacturing process, where stage inspections are normally carried out of quality control and details of such tests and inspections.
- List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-à-vis type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations.

The manufacturer laboratory must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conducting

a) The routine tests.
b) Acceptance tests shall be furnished with the bid.

8. MANUFACTURING ACTIVITIES

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

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re flow solder process. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter at least up to 10 years. Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and of tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing.
At insertion stage, all components should undergo testing for conforming to design parameters and orientation.

Complete assembled and soldered PCB should undergo functional testing using test equipments (testing jig).

Prior to final testing and calibration, all meters shall be subjected to accelerated ageing test to eliminate infant mortality, i.e, meters are to be kept in ovens for 72 hours at 55 deg. Centigrade temperature & atmospheric humid condition. After 72 hours meters should work correctly. Facilities / arrangement for conducting ageing test should be available with the manufacturer.

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer.

A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

9. DOCUMENTATION :

One set of routine test certificates shall accompany each dispatch consignment. The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

10. GUARANTEE:

The meters should be guaranteed against any manufacturing defects arising out of faulty design or bad workmanship or component failure for a period of **5 ½ years** from the date of supply.

Life of battery used for the meter should be guaranteed for **10 years.**
If the meter/battery/Latching relay found defective within the above guarantee period, it should be replaced by the supplier free of cost within 30 days of the receipt of intimation of failure / defect. The pick up and delivery points are the respective utility sites.

REPLACEMENT OF DEFECTIVE METERS :

The meters declared defective by the Utility shall be replaced by the supplier up to the full satisfaction of the Utility at the cost of supplier. Failure to do so within the time limit prescribed shall lead to imposition of penalty of twice the cost of meter. The same may lead to black listing even, as decided by Utility. In this connection the decision of Utility shall be final.

11. PACKING & FORWARDING :

The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.
The packing shall be done as per the standard practice as mentioned in IS 15707 : 2006. Each package shall clearly indicate the marking details (for e.g., manufacturer's name, Sl. Nos. of meters in the package, quantity of meter, and other details as per supply order). However, he should ensure the packing is such that, the material should not get damaged during transit by Rail / Road.

12. GENERAL :

a) Principle of operation of the meter, outlining the methods and stages of computation of various parameters starting from input voltage and current signals including the sampling rate, if applicable shall be furnished by the bidder.

b) The Components used for manufacture of meter should be of high quality and the bidders should confirm component specification as specified below in Annexure-I.

ANNEXURE-I

Component Specifications

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.	Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, NEC, Texas Instruments, Phillips, Siemens, Prolific Technology
3.	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian, Prolific Technology
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 70^{o}.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.	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY, Prolific Technology
5.	Communication modules	Communication modules should be compatible for the RS 232 ports	National Semiconductors, Hitachi, Texas Instruments, Philips, HP, Agilent, Prolific Technology

6.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily. **Infrared communication port is not acceptable.**	National Semiconductors, Hitachi, Texas Instruments, Siemens, Agilent, Philips, Hp, Prolific Technology
7.	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
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.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National Semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS, Prolific Technology
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.	RTC Battery	Lithium / Lithium-ion with guaranteed life of 10 years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Tadiran, Duracell, Tekcell, Prolific Technology
11.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, OKI, EPSON, Prolific Technology