INDEX

1.00 SCOPE:

This specification covers the design, engineering, manufacture, assembly, stage testing, inspection and testing before dispatch and delivery at designated stores of ISI marked LT AC 10 - 60 Amps AMR compatible Prepaid Static LCD Energy Meter of class 1.0 accuracy confirming to IS: 15884 / 2010 suitable for measurement of Energy (kWh) and Demand (kWMD) in Single Phase, Two wire system of LT single phase residential, LT single phase commercial & LT single phase temporary consumers.

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

New L&F connections shall be provided with prepaid meters. For commissioning of a meter at consumer premise, a consumer database shall be defined with appropriate tariff category and credit / debit limit, after which a token shall be generated to energize the meter. This database & tariff configuration shall be prepared by manufacturers' authorized person. The necessary information required for tariff configuration shall be supplied by MSEDCL's authorized person from time to time (based) upon regulatory directives. The meter must have the feature of inter operability / inter portability at vending end. The prepaid metering solution shall be integrated with MSEDCL's billing solutions, MSEDCL website & payment gateway.

2.00 APPLICABLE STANDARDS:

This specification describes the prepayment metering system which excludes the vending infrastructure but includes the consumer interface unit (CIU). The Meter shall comply with IS: 15884 / 2010 of the latest version including CBIP Tech – report - 88 amended up to date. The specification given in this document supersedes the relevant clauses of IS: 15884 / 2010 of the latest version wherever applicable and IEC 61036 or IS: 15884 / 2010 and IEC 62055-31.

3.00 SERVICE CONDITIONS:

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

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

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

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

Environmental Conditions

d)	Maximum ambient temperature	55^0C
e)	Maximum ambient temperature in shade	45^0C
f)	Minimum temperature of air in shade	35^0C
g)	Maximum daily average temperature	40^0C
h)	Maximum yearly weighted average temperature	32^0C
i)	Relative Humidity	10 to 95 %
j)	Maximum Annual rainfall	1450 mm
k)	Maximum wind pressure	150 kg/m^2
l)	Maximum altitude above mean sea level	1000 meter
m)	Isoceraunic level	50 days/year
n)	Seismic level (Horizontal acceleration)	0.3 g

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

4.00 SYSTEM ARCHITECTURE:

The prepayment metering system shall comprise of three components.

i) Meter

ii) Consumer Interface Unit (CIU) with required telephonic cable

iii) Existing Vending Station

5.00 GENERAL TECHNICAL REQUIREMENTS:

The equipment shall conform to the following specific parameters.

5.01 The meter shall bear ISI mark.

5.02 **Class of Accuracy:**

The class of accuracy of the Energy Meter shall be 1.0. The accuracy shall not drift with time.

5.03 **Current & Voltage Rating**:

The current rating shall be 10 - 60 Amps. The rated basic current (Ib) for LT AC Static Energy Meter shall be 10 Amps.

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

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

5.04 **Temperature:**

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

5.05 **Power Factor:**

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

5.06 **Power Consumption.**

5.06.1 **Voltage Circuit**:

The active & apparent power consumption in voltage circuit including power supply of meter at reference voltage, reference temperature & frequency shall not exceed 1.5 Watt & 8.0 VA.

5.06.2 **Current Circuit**:

The apparent power taken by current circuit at basic current, reference frequency & reference temperature shall not exceed 2.5 VA.

5.07 **Starting Current.**

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

5.08 **Frequency.**

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

6.00 CONSTRUCTION:

6.01 **GENERAL MECHANICAL REQUIREMENT:**

The prepayment meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

a) personal safety against electric shock:

b) personal safety against effects of excessive temperature;

c) protection against spread of fire;

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

6.02 Meters are required for measurement of Active Energy and shall conform to the latest edition of IS: 15884 / 2010 (Alternating Current Direct Connected Static Prepayment Meters for Active Energy (Class 1 and 2) – Specification.

6.03 The meter shall measure the electrical energy consumed and shall decrement the 'available credit register' in accordance with the energy consumption (kWh). The 'available credit register' shall get incremented as and when payment is made to the electricity supplier (MSEDCL). The meter shall continuously debit against the consumption.

6.04 All parts, which are subject to corrosion under normal working conditions, shall be protected effectively against corrosion by suitable method to achieve durable results.

Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions.

The electrical connections shall be such as to prevent any opening of the circuit under normal conditions of use as specified in the standard, including any overload conditions specified in the standard.

The construction of the meter shall be such as to minimize the risks of short-circuiting of the insulation between live parts and accessible conducting parts due to accidental loosening or unscrewing of the wiring, screws, etc. The meter shall not produce appreciable noise in use.

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

6.06 **METER CASE:**

The base and cover shall be ultra-sonically welded (continuous welding) so that once the meter is manufactured and tested at factory, it shall not be possible to open the cover at site except the terminal

cover and any non-permanent deformation cannot prevent the satisfactory operation of the meter. The components shall be reliably fastened and secured against loosening. The Manufacturer shall put at least one seal on meter body before dispatch. The thickness of material for meter body shall be 2 mm minimum.

The holding on and sealing screws shall be held captive in the meter cover.

The meter shall have a durable and substantially continuous enclosure made wholly of insulating material, including the terminal cover which envelopes all metal parts.

6.07 **TERMINALS & TERMINAL BLOCK:**

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

6.07.2 The material of which the terminal block is made shall be capable of passing the tests given in IS 1336O (Part 6/Sec 17) for a temperature of 1350C and a pressure of 1.8 MPa (Method A). The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to also accommodate the insulation of the conductors.

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

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

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

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

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

6.07.8 The termination arrangement shall be extended type as per clause number 4.2.5 of IS 15884 / 2010 irrespective of rear connections.

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

6.08 **TERMINAL COVER:**

6.08.1 Moulded terminal block for current and voltage connections conforming to IS: 15884 / 2010 to meet the requirement of terminal connection arrangement shall be provided. The termination arrangement shall be provided with an extended transparent terminal cover as per clause number 4.2.5 of IS 15884 / 2010 irrespective of rear connections and shall be sealable independently to prevent unauthorized tampering.

6.08.2 The terminal cover of a meter shall be sealable independently of the meter cover to prevent unauthorized tampering. The terminal cover shall enclose the actual terminals, the conductor fixing screws and unless otherwise specified, a suitable length of external conductors and their insulation.

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

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

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

6.09 **RATING OF TERMINALS:**

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

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

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

6.12 The push button shall be provided for high resolution reading of display with two decimal digits as brought out elsewhere in this specification (optional).

6.13 **RESISTANCE TO HEAT AND FIRE:**

The terminal block, the terminal cover, the insulating material retaining the main contacts in position and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermal overload of live parts in contact with them. The material of the terminal block should not deflect under heating. To comply therewith, they must fulfill the tests as specified in 5.2.4 of IS 15884 / 2010.

6.14 **REAL TIME INTERNAL CLOCK (RTC):**

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

The RTC shall have long life (10 Years) with Non rechargeable battery.

6.15 Meter memory shall have the following details.

- Transaction history data with date & time,
- All the events with time based and category based information,
- Tariff details including the slab tables and information about the current active rate price,
- Monthly history and consumption data of the energy consumed for the last 6 months,
- ABC Codes
- All the account related information like meter credit, emergency credit, minimum charges, fixed charges, unit charges, etc.
- All the limiting parameters shall also be available in meter reading

6.16 **RETENTION TIME OF THE NON-VOLATILE MEMORY:**

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

6.17 **OUTPUT DEVICE:**

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

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

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

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

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

6.20 The meter shall be capable to withstand phase to phase voltage (440V) if applied between phase to neutral for minimum 5 min.

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

6.22 The accuracy of the meter shall not be affected with the application of abnormal voltage / frequency generating device such as spark discharge of approximately 35 KV. The meter shall be tested by feeding the output of this device to meter in any of the following manner for 10 minutes:

a) On any of the phases or neutral terminals
b) On any connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)
c) At any place in load circuit
d) At any location of meter body

The accuracy of the meter shall be checked before and after application of above device.

6.23 Meter shall be tamper proof. No tampering shall be possible through RS 232 port, RS 485 port, through keypad or through 4 core telephonic connector cord of CIU.

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

6.25 Complete metering system & measurement shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech - report 88 (amended up to - date) except 0.2 T AC magnet test.

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

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

6.28 **SELF DIAGNOSTIC FEATURES:**

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

6.28.2 The meter shall display unsatisfactory functioning / nonfunctioning / malfunctioning of Real Time Clock, battery.

6.28.3 All display segments:

"LCD Test" display shall be provided for this purpose.

6.29 Wire / cable less design:

The meter shall be wireless to avoid improper soldering & loose connection / contact.

6.30 The meter shall be capable of being read through hand held unit (HHU) / Common Meter Reading Instrument (CMRI) and AMR through RS 485 port.

6.31 **LATCHING RELAY (LOAD SWITCH):**

6.31.1 Meter shall have two latching relays for phase and neutral to protect the common tamper of phase and neutral interchanged, load through local earth, single wire tamper as well as to disconnect the full load.

6.31.2 The latching relay shall be bi-stable type latching switch designed and manufactured in accordance with international standard of IEC and DIN EN 61810 part 1 / VDE 0435 part 201 as well as they shall meet the overload and short circuit requirement of IEC, DIN EN 61036 / 61037, ANSI C12 & IS 3231. The Latching relay shall confirm to the load switching capabilities as per relevant IS. The latching relay shall be with trip-free design as given in IS.

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

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

6.31.5 As the balance credit decreases beyond pre-defined level, the latching relay shall disconnect the supply to the load.

6.31.6 The reading process of a valid token shall not be adversely affected by coincident switching of the latching relay while making or breaking currents under rated operating values of voltage and current.

6.31.7 Once the load is interrupted by low credit in the meter accounting process, the latching relay shall only be operable to restore the load after a further appropriate manual intervention, for example by manually presenting a further credit token.

6.32 The meter shall be able to disconnect the load in case of exceeding the current limit (120% I_{max}) after 1 minute on stabilizing the current.

6.33 **COMMUNICATION CAPABILITY:**

The meter shall have data downloading facility with prepaid meter events like transactions (including the debit / credit balance at the end of the month, consumption at the end of the month and particular wise details of the monthly energy bill like Fixed Charges, Unit charges, etc. as are applicable for post paid meter connections), alarm, overload, tamper, load survey, etc. through a hardware port compatible with RS 485 specifications which shall be used for remote access through suitable Modem (GPRS / GSM / EDGE / CDMA / PSTN / LPR) or HHU / CMRI. The required software shall be supplied by the vendor free of cost.

Likewise, to display the parameters on CIU, additional hardware port compatible with RS 485 specifications shall also be provided.

Sealing arrangement for both the ports shall be provided.

These ports shall support the default and minimum baud rate of 9600 bps. Necessary chord of minimum length of one mtr per meter shall be provided free of cost.

7.00 WEB BASED VENDING SOFTWARE SYSTEM:

The web based vending software system of MSEDCL is already in operation. Hence meter management of the meter shall be done using this existing prepaid vending solution only.

8.00 CONSUMER INTERFACE UNIT (CIU):

The meter shall be supplied with a separate display unit / consumer interface unit (CIU). The same shall be used by consumers to enter credit and access meter information as well as to get alarm on low credit or overload condition. Wired Customer Interface Unit shall have high - resolution display which shall be user friendly and provides a host of information to the consumer. (CIU is mandatory for every meter.)

a. The CIU shall be powered up from the meter.

b. The CIU shall have a display similar to that of the meter.

c. The CIU shall have an LCD display similar to that of the meter.

d. The CIU shall have a keypad to enter the code.

e. The CIU shall have additional RS 232 port with USB type connector to transfer the token from STTD as per clause no. 10.00 of this specification. (optional)

f. The CIU and meter shall have RS 485 port connectivity upto 100 mtrs.

g. The distance between the display unit and the prepayment meter shall be up to 100 meters.

h. The CIU and energy meter shall be connected using a 4 wire connection cable similar to telephone cable. The required 4 wire telephonic connection cable of 30 mtr length per meter shall be provided. The 4 wire telephonic connection cable shall be connected to CIU and meter with required 4 pin telephonic connectors. The required 4 pin connectors shall also be provided.

i. The CIU shall have a buzzer to generate alarm signal in case of low credit and overload.

j. The CIU shall have same keys as that on the meter.

k. CIU shall communicate with the meter by means of RS 485 port.

9.00 SOFT TOKEN TRANSFER DEVICE (STTD) SPECIFICATIONS: (OPTIONAL)

9.01 One no. of Soft Token Transfer Device (STTD) shall be supplied with each CIU unit.

9.02 STTD shall be USB 2.0 compliant and shall be able to connect to the USB port of PC.

9.03 All the software & drivers required to connect to the PC shall be supplied free of cost with STTD.

9.04 An LED for Power ON indication shall be provided. Same LED shall blink during communication.

9.05 Device shall be capable to store & transfer all type of tokens required for Credit / tariff change / fixed charges etc.

9.06 After the transfer of tokens from STTD to the CIU, the ABC code, final Credit after token entry, Cumulative kWh &, token entry date and time shall be transferred to STTD from CIU.

10.00 TOKEN CARRIER INTERFACE - KEYPAD:

10.01 The token carrier interface in the form of keypad shall be provided on the meter front cover for token punching to energize the meter and view display details of various parameters provided on respective key.

10.02 The Keypad shall have buttons which enables the user to press and view various displays available on the meter.

10.03 The keypad buttons shall have numbers / letters on them, which shall be clearly visible and resistant to wear.

10.04 The layout of the numbering shall be same as that used on standard telephones for numbers '1' through '9' and buttons such as '*','0', and '#'.

10.05 Button '5' shall have some form of physical identification (raised printing or a pip) to aid customers with poor sight.

10.06 The keypad IP rating shall be adequate to permit use with moist or wet hands whilst ensuring the safety of the user and preventing ingress of dirt and water to the unit. The keypad shall also be intrinsically safe and provide protection from damage by means of sharp objects and electrostatic discharges.

10.07 The keypad buttons shall provide audible feedback when pressed with differing tones to distinguish between valid and invalid entry.

10.08 The entry of codes for credit or commands associated with programming functions such as tariff change shall be via numeric codes.

10.09 Code encryption / decryption must be carried out using an internationally recognized standard (i.e. Triple DES).

10.10 The meter shall permit a time delay of up to 20 seconds between keystrokes.

10.11 The keypad interface shall be designed to operate for a minimum of 20,000 operations of each individual key.

10.12 It may also be possible to enter the code through USB type connector provided on CIU using the STTD.

11.00 TARIFF:

11.01 It shall be possible in the meter that the Tariff Order in force at the relevant time shall be made applicable and shall continue till the consumer approaches for next recharge. If there are any changes, after the purchase of electricity units in advance by a prepaid consumer, due to tariff revision, Fuel Adjustment Cost (FAC) Charges, etc., the same shall be adjusted at the time of the next recharge.

11.02 Following are the features required in the meter for Tariff. It shall be possible to change all the tariff related parameter through vend code.

(i) **Fixed Charges**:

Meter shall be able to deduct fixed charges as a whole for the full month as per the tariff applicable. The fixed charges shall be defined using the online vending system.

(ii) **Slab Tariff**:

The meter shall have capability for defining minimum six tariff slabs. It shall be possible to change the slabs through the portable device or through the online vending system. The tariff shall be applicable for the month as per the tariff structure.

(iii) **Tax/Duty**:

It shall be possible to define the tax percentage through online vending system which has to be levied on the amount of the energy consumed.

(iv) **Rebate**:

The meter shall have facility to record the energy consumption at the rates applicable after deducting the rebate percentage on the energy consumption.

(v) **Debt Management**:

It shall be possible to collect the debt from the consumers with the use of the online vending system. The debt percentage shall be defined in the vending system.

(vi) **Software Feature**:

The meter shall be programmable for tariff structure, tax / rebate, duty, tariff slabs, etc. as per the orders given by MERC from time to time.

The end result of the tariff made applicable shall be as per MERC orders.

12.00 PREPAID FEATURES:

12.01 TOKEN AND CREDIT AMOUNT:

Debit limit upto five digits INR shall be provided into the meter.

12.02 The meter shall display message on accepting valid token transaction and on rejecting invalid token transaction with an additional sound.

12.03 If the token is not accepted due to the disturbance caused by the latching relay, then it shall not be invalidated and shall be accepted when presented to the payment meter subsequent to the disappearance of the disturbance.

12.04 The meter shall be capable to accept numeric token via Keypad (or USB port provided on the CIU) and credit the purchased amount to the meter. This credit shall be added to the existing balance available in the meter and the same amount shall also be added to cumulative amount credited to meter.

12.05 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.

12.06 Meter shall be able to deduct fixed charges as a whole for the full month as per the tariff applicable. There shall be no need of any token transaction to stop fixed charge recovery while meter is removed from the site and kept in store.

12.07 A visible low credit warning shall be provided with bi-color LED / LCD indication (Prefer Green for healthy zone, else change from Green to flickering Red color) when the credit falls below defined alarm limit.

12.08 An audible low credit warning shall be provided to sound for 30 seconds, first warning shall be after half an hour, thereafter second warning after two hours and third warning after 10 hours and thereafter every 10 hours of low credit till the alarm is acknowledged by the consumer by pressing either meter or CIU key. There shall be no alarm during night hours.

12.09 When the credit reaches to zero, the meter shall disconnect the output supply except emergency credit limit of "1 working Day / happy hours" (from 1730 hours of previous day of second & fourth Saturdays & Sundays, National Holidays, state fixed holidays & Night Time till 1100 hours of next working days) is provided to consumer or meter is charged with a new token which has additional amount than zero. It shall give alarm when the credit balance is Rs. 100.00.

12.10 Meter shall be capable to configure for Emergency credit limit so that some defined amount could be provided to consumer after zero balance. After this defined amount, meter shall disconnect the output supply and restore only when meter balance reach to the amount additional than zero.

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

13.00 ANTI TAMPER FEATURES & TAMPER EVENTS:

The meter shall detect and register the energy correctly only in forward direction under any one or combination of following tamper conditions:

13.01 Reversal of phase & neutral.

13.02 Load through local Earth: The meter shall work accurately without earth.

13.03 All the above tampers will be verified at basic current at reference voltage.

13.04 The potential link shall not be provided on terminal block outside the main meter cover.

13.05 Visual indication shall be provided to show tamper conditions stated above in push button mode.

13.06 The meter shall be immune to the magnetic field (DC / Permanent) up to 0.2 Tesla. If the meter accuracy gets affected due to any abnormal magnetic field (DC / Permanent) more than 0.2 Tesla, then the same shall be recorded as magnetic tamper event with date & time stamping and the meter shall record Energy considering the maximum value current (Imax) at reference voltage & unity power factor.

13.07 In the event the meter is forcibly opened, even by 2 to 4 mm variation of the meter cover, same shall be recorded as tamper event with date & time stamping and the meter shall continuously display that the cover has been tampered. It is suggested that the manufacturer shall

develop their software such that there will be some time delay for activation of this tamper feature and during that period only the meter cover shall be fitted. The delay in activation of software shall be for one instance only. After the meter cover is fitted, it shall get activated immediately with out any delay.

14.00 DISPLAY OF MEASURED VALUES:

14.01 The display shall be permanently backlit LCD, visible from the front of the meter. The display shall be electronic and when the meter is not energized, the electronic display need not be visible.

14.02 **MINIMUM CHARACTER SIZE:**

The Energy display shall be minimum 5 digits. The height of the display characters for the principal parameters values shall not be less than 5 mm. The size of digit shall be minimum 9x5 mm.

14.03 The principal unit for the measured values shall be the kilowatt hour (kWh) and the maximum demand in kW (kWMD) alongwith the time.

14.04 The decimal units shall not be displayed for Cumulative kWh in auto scroll mode. However it shall be displayed in push button mode for high resolution display for testing.

14.05 The meter shall display current account information in terms of balance amount left for consumption in terms of energy units or monetary value.

14.06 The meter shall have facilities to measure, record and display the parameters as per IS: 15884 / 2010. Meter communication shall comply as per IS: 15884 / 2010.

14.07 Where multiple values are presented by a single display, all relevant values shall be available via appropriate selection (choice of selection shall be general, for example keypad or push button). When displaying the values, each tariff register shall be identifiable and the active tariff rate shall be indicated. (This can be done either by legends or by display headers before the actual parameter.)

14.08 The register shall be able to record and display starting from zero, for a minimum of 1500 h, the energy corresponding to maximum current at reference voltage and unity power factor. The register shall not rollover during this duration.

14.09 **DISPLAY INDICATORS:**

The following shall be displayed permanently by LED / LCD as a minimum and shall be visible from the front of the prepayment meter.

a. Supply indication.

b. Relay status.

c. Earth load indication (if condition occurred).

d. Meter cover forcibly open tamper event

14.10 **MINIMUM DISPLAY CAPABILITY (MEASURING PARAMETERS):**

(A) AUTO SCROLL MODE:

The following parameters shall be capable of being displayed on the prepayment meter in auto scroll mode.

(i) Date & time

(ii) LCD check

(iii) Active Energy.

(a) Cumulative kWh

(b) Units in kWh & amount in INR used from last recharge

(iv) Credit balance at the instant.

(v) Days left, based on the last seven days average consumption

All the above parameters shall be displayed for minimum 10 seconds including LCD check.

(B) PUSH BUTTON MODE:

The following parameters shall be capable of being displayed by prepayment meter in push button mode or any other suitable key (out of 9, 0, *, #)

(i) Instantaneous Voltage

(ii) Instantaneous Current

(iii) High Resolution kWh with two decimal points

(iv) Software version of meter

(v) No. of transactions accepted & rejected

(vi) Power ON Hours

(vii) No. of switch open or close operations

(viii) Start & end time of happy hours credit

(ix) Maximum current & load limit set in meter

(x) Maximum current recorded

(xi) Total credit added till date

(xii) kWMD information along with date & time

(xiii) Consumption history for last 6 months.

(xiv) Tamper Events

(C) DISPLAY AFTER PRESSING KEYPAD BUTTONS:

The parameters on pressing keypad nos. shall be as below.

Sr. No.	Key No.	Description
i	1	Date / Time and Retained credit codes
ii	2	Days Left (based on consumption of last seven days)
iii	3	Currently active rates, the prices charged for consumption at each rate, and the number of units consumed at each rate and the daily charges.
iv	4	Current load and the cost of that load
v	5	"*Authenticated Billing Code*"# and the total amount vended.
vi	6	Daily charge shown for previous day
vii	7	Maximum Demand with occurrence of time
viii	8	kWh unit

 # "Authenticated Billing Code"

The meter shall display the authenticated meter reading code on pressing key 5. The token shall contain the following frozen value at midnight (00:00 Hrs) of month end.

i. 5 digit cumulative kWh energy register.

ii. The tamper flag, which only indicates whether there is any tamper or not.

iii. Date of frozen data

iv. Credit balance

15.00 MAXIMUM DEMAND INTEGRATION PERIOD:

Integration period for kWMD shall be of 30 minutes real time based.

16.00 MAXIMUM DEMAND RESET:

The maximum demand shall automatically be reset at 2400 hours of the last day of each calendar month. No reset push button shall be provided.

17.00 BILLING HISTORY, LOAD SURVEY & TAMPER DATA:

17.01 BILLING HISTORY:

The meter shall have sufficient non-volatile memory for recording history of billing parameters (Cumulative kWh at the time of reset and kWMD) for last 6 months.

17.02 LOAD SURVEY PARAMETERS:

The load survey parameters shall be kWh, Voltage and Current.

The logging interval for load survey shall be 30 minutes. Load survey data shall be logged for last 45 days on non time based basis, i.e. if there is no power for more than 24 hours, the day should not be recorded. Whenever meter is taken out and brought to laboratory the load survey data shall be retained for the period of actual use of meter. This load survey data can be retrieved as and when desired and load profiles shall be viewed graphically / analytically with the help of meter application software. The meter application software shall be capable of exporting / transmitting these data for analysis to other user software in spreadsheet format

17.03 TAMPER DATA:

The meter shall record the tamper events as specified in the specification. The meter shall keep records for the minimum 100 events. (Occurrence + Restoration).

For these abnormal conditions, the recording of events shall be on FIFO basis.

It shall be possible to retrieve the abnormal event data along with all related snap shots data through RS 485 port with the help of laptop PC / HHU / CMRI / AMR and downloaded the same to the base computer. All the information shall be made available in simple & easy to understand format.

18.00 PREPAID METERING, BILLING & COLLECTION SYSTEM REQUIREMENT:

a) This section specifies the requirements of the Prepaid Metering, Billing & 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 & Collection system of MSEDCL. The keypad technology is future proof, cost effective and in this communication age, shall enable consumers to buy electricity over the multiple vending options like MSEDCL billing centers, MSEDCL website, through third party POS providers.

c) The vending machine (PC for running vending software) shall be placed at the Cash Collection Centres of MSEDCL for which necessary office space, electricity etc. and furniture for this system shall be provided by MSEDCL. Cash shall be collected by MSEDCL 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 machine.

19.00 PREPAID METERING, BILLING & COLLECTION SOFTWARE:

19.01 The meter shall work with the token generating software available with MSEDCL. The token decryption algorithm shall be as per Annexure III.

19.02 The meter manufacturer shall provide API / Exe file with documentation for AMR, i.e. for downloading the data.

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

19.04 API which will be residing on CMRI will be given to MSEDCL free of cost with all its documentation and training. Without API, the meter samples will not be approved.

19.05 For the purpose of AMR, API should be compatible with MIOS version 3.0.

20.00 DEMONSTRATION:

The purchaser reserves the right to ask for the demonstration of the equipment offered at the purchaser's place.

21.00 CONNECTION DIAGRAM AND TERMINAL MARKINGS:

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking shall appear in the above diagram. Stickers of any kind shall not be accepted.

22.00 MARKING OF METER:

22.01 NAME PLATE:

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standard. The manufacturer's meter constant shall be marked on the Name Plate.

In addition to the requirement as per IS, following shall be marked on the Name Plate.

Purchase Order No.

Month and Year of manufacture

Name of purchaser i.e. MSEDCL

Guarantee Five Years

ISI mark

The meter Serial No. shall be Bar Coded along with Numeric No. The size of Bar Code shall not be less than 35x5 mm. Stickers in any case will not be accepted.

23.00 TESTS:

23.01 TYPE TESTS:

The prepayment meter offered shall be fully type tested for the properties / requirement as per IS: 15884 / 2010 and external AC/DC (except 0.2 T AC magnet) magnetic influence tests as per CBIP Tech-Report 88 with latest amendments.

Type test reports shall be submitted along with offer.

The Type Test Reports shall clearly indicate the constructional features of the type tested meter.

Separate Type Test Reports for each offered type of meter shall be submitted.

All the Type Tests shall have been carried out from Laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, Bangalore / Bhopal, ERDA Vadodara, ERTL to prove that the meter meet the requirements of the specification.

Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable.

Type Test for Prepaid Features as per IS shall be confirmed for the parameters indicated elsewhere in the specification at manufacturers' lab during inspection.

All The type test reports of meter shall be got approved from Chief Engineer, MM Cell before commencement of supply.

The type test report of meter carried out during last three years shall be valid.

The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost.

23.02 Meter shall pass all the acceptance and routine tests as laid down in IS: 15884 / 2010 and also additional acceptance tests as prescribed in this specification. (3 to 8 meter from a lot more than 1000 will be sealed randomly in the factory and will be tested for tamper events)

23.03 **ADDITIONAL ACCEPTANCE TESTS:**

The following additional tests shall be carried out in addition to the acceptance tests specified in IS: 15884 / 2010 (amended up to date).

(a) ACCEPTANCE TEST FOR PREPAID FEATURES:

i) Test of credit balance & debit.

ii) Test of friendly credit hours, Start & end time there of

iii) Test of disconnect the output supply when credit reach to zero.

iv) Test of reconnect the output supply on providing credit limit/ charging with new token.

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

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

vii) Test of visible & audible low credit warning.

viii) Test of application of tariff.

(b) TRANSPORTATION TEST:

At least 50% of the samples of the meter shall be tested for error at Imax, Ib and 5% Ib at unity power factor and 50% Imax and 10% Ib at 0.5 lagging Power Factor besides checking them for starting current. The meter shall be tested with meter cover duly tightened and sealed properly. After recording these errors, the meter be put in their normal packing and transported for at least 50 km in any

transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation shall not exceed 1% at higher loads and 1.5% at low loads.

(c) OTHER ACCEPTANCE TESTS:

i) Glow wire testing for polycarbonate material.

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

iii) Tamper conditions as stated in this specification,

iv) Power consumption tests,

v) Limits of error: Limits of variation in percentage error due to change in voltage shall not exceed the values given in the following table:

S N	Influence quantities	Value of current	Power factor	Limits of variation in % error for class 1 meter
a	Voltage variation – 15% to +10%	I_b I_b	1 0.5 lag	0.7 1.0
b	Voltage variation – 40% to +20%	I_b I_b	1 0.5 lag	1.1 1.5

vi) 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.

vii) For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS: 15884 / 2010 (amended up to date).

viii) 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 subjected to accuracy test as per IS: 15884 / 2010 (amended up to date). No deviation in error is allowed in the accuracy as per specifications.

ix) The meter shall withstand impulse voltage at 10 kV.

The test 23.03 (c) (i) to (vii) shall be carried out at factory for each inspected lot at the time of pre-dispatch inspection.

The tests 23.03 (c) (viii) & (ix) shall be carried out on one sample from first lot as per procedure laid down in IS 15884 / 2010 (amended up to date) and CBIP Tech-Report 88 in NABL LAB. The test report shall be got approved from Chief Engineer, MM Cell before commencement of supply.

24.00 GUARANTEED TECHNICAL PARTICULARS:

The tenderer shall also furnish the particulars giving specific required details of Meter in schedule `A' attached. The offers without the details in Schedule 'A' stands rejected.

25.00 TENDER SAMPLE:

Tenderer are required to submit 10 (Ten) nos. of sample meters along with CIU, connecting telephonic cable with connectors fixed to cable of each offered type / item along with the offer for testing in third party NABL Lab like ERDA, CPRI, ERTL. The offer of those eligible bidders shall only be considered if the meter sample passes the tests at NABL Lab. The results of NABL Lab shall not be disputed and shall be binding on the bidder. The required information such as Manufacturer's Name or Trade Name, Sr. No., ISI Certification No. etc. shall be on stickers to be affixed on outer portion of sample meters being submitted along with the offer. Such information shall not be embossed or printed on any part of the sample meter.

Out of these, two samples shall be without Ultrasonic welding to confirm constructional features.

26.00 PRE DESPATCH INSPECTIONS:

All Acceptance tests and Inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer to the inspector representing the purchaser,

all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The Company's representative / Engineers attending the above testing shall carry out testing on suitable number of meters as per sampling procedure laid down in IS 15884 / 2010 and additional acceptance test as per this specification and issue a test certificate approval to the manufacturer and give clearance for dispatch. All the meters offered for inspection shall be in sealed condition. The seals of sample meter taken for testing & inspection shall be break open & resealed after inspection. The routine tests of latching relay shall also be carried out & confirmed as per IS: 3231/1987.

The first lot of meter may be jointly inspected by the Executive Engineer, Testing Division and the Executive Engineer, Inspection Wing.

27.00 RANDOM SAMPLE TESTING (INSPECTION AFTER RECEIPT AT STORES):

For carrying out "Random Sample Testing (RST), the sample meter will be drawn from any one of the stores against inspected lot and same shall be tested at respective Testing and Quality Assurance units at Aurangabad, Bhandup, Kolhapur, Nagpur, Nashik & Pune. Sample meter shall be drawn as per Appendix "H" of IS 13779 / 1999 (amended up to date). Sample meter will be tested by MSEDCL Testing Engineer in presence of supplier's representative jointly for (i) starting current, (ii) Limits of error, (iii) Repeatability of error, (iv) No Load Test as per IS 15884 / 2010 (amended up to date) (v) Test for prepaid feature as per clause no. 24.03 (a). The RST shall be carried out at the Testing Division allotted by Chief Engineer, MM Cell.

The 5 days advance intimation shall be given to the supplier and if the supplier fails to attend the joint inspection on the date informed, the testing will be carried out by our testing engineer in absence of supplier's representative. If the meter fails in above random sample testing, the lot will be rejected.

28.00 TRAINING:

The bidder / manufacturer shall arrange various training programmes for administration training, user training and trouble shoot training free of cost with supported documents like system software manual, system operation manual. Training shall be imparted to at least 100 officers for user training and at least 5 officers for administration training.

29.00 GUARANTEE:

The meters, CIUs and allied software / hardware shall be guaranteed for the period of five years from the date of successful commissioning certificate from the concerned circle office of MSEDCL or five and half years from the date of dispatch whichever is later. The meter and allied software / hardware found defective within above guarantee period shall be replaced by the supplier free of cost, within one month of receipt of intimation. If defective meter are not replaced within the specified period as above, the Company shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier. During the guarantee period software changes required (e.g. tariff changes, any other statutory changes etc.) are to be implemented by the vendor free of cost.

The meter vendor shall give the guarantee of the meter and allied software / hardware as per the tender conditions and also observe the performance of the meter on site for a period of at least one year and monitor the accuracy of the same independently & submit a report of the same.

30.00 PACKING:

30.01 The meters, CIU, etc. shall be suitably packed in order to avoid damage during transit or handling. Each meter, CIU may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

30.02 The following information shall be furnished with the consignment:

(i) Name of the consignee

(ii) Details of consignment

(iii) Destination

(iv) Total weight of the consignment

(v) Sign showing upper / lower side of the crate

(vi) Sign showing fragility of the material

(vii) Handling and unpacking instructions

(viii) Bill of Material indicating contents of each package and spare material.

31.00 QUALITY CONTROL:

31.01 The purchaser has a right to send a team of experienced engineers for assessing the capability of the firm for manufacturing and testing of meters as per this specification. The team shall be given all assistance and co-operation for inspection and testing at the bidder's works.

31.02 Meters supplied shall give service for a long period without drifting from original calibration & performance must be near to zero percent failure.

32.00 MINIMUM TESTING FACILITIES:

Manufacturer shall posses fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS 15884 / 2010 (amended up to date). Test Reports for each and every meter shall be generated. The list of testing equipments shall be enclosed.

(i) The manufacturer shall have the necessary minimum testing facilities for carrying out the following tests:

a) Insulation resistance measurement

b) No load condition

c) Starting current

d) Accuracy requirement

e) Power consumption

f) Repeatability of error

g) Transportation test – as per clause no. 25.03 (b)

h) Tamper conditions - as per clause no. 18.03

i) Prepaid Feature Testing Facility as per clause no. 25.03 (a) & IS.

(ii) The manufacturer shall have duly calibrated RSS meter of class 0.1 or better accuracy. The bidder shall have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly.

(iii) The manufacturer shall have Glow Wire Testing facility

(iv) Meter Software: The Bidders will have to get appraised & obtain CMMI – Level III within one year from date of letter of award.

33.00 MANUFACTURING ACTIVITIES:

The manufacturer shall submit the list of plant and machinery along with the offer.

A. Meter shall be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process. The loops/wired joints must be avoided on PCB. Further, the Bidder shall own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities.

B. Quality shall be ensured at the following stages:

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

   b) At insertion stage, all components shall undergo computerized testing for conforming to design parameter and orientation

   c) Complete assembled and soldered PCB shall undergo functional testing using Automatic Test Equipments (ATEs).

   d) Important:

      Prior to final testing and calibration, all meters shall be subjected to ageing test (i.e. Meters will be kept in heating chamber for 72 hours at 55^{O} C temperature at full load current. After 72 hours, meter shall work satisfactory) to eliminate infant mortality.

C. The calibration of meter shall be done in-house on a computerized testing bench having stabilized power supply.

D. The bidders shall submit the list of all (imported as well as indigenous) components to be used in meter, separately along with the offer. List of makes of components is attached herewith as a guide line (Annexure-II).

E. Bought out items:

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

F. List of Plant and Machinery used for Energy meter Production.

Sr. No.	**List of Plant and Machinery used for Energy meter Production**	
1	Fully automatic testing Bench with ICT for testing link less meter	Routine Testing and Calibration of Meter
2	Semi automatic testing Bench with MSVT	Routine Testing and Calibration of Meter
3	IR Tester	Insulation testing
4	HV Tester	Insulation testing
5	Error calculators	Error testing
6	Long duration Running test set ups	Reliability Testing
7	Reference Meter class 0.1 accuracy	Error calculation
8	Ultrasonic welding Machines	Welding of meter
9	Automatic Pick and Place Machines	Automatic placing of SMT components
10	Solder Paste Printing Machine	SMT soldering
11	Soldering Furnace IR reflow	SMT soldering
12	PCB Scanner	For testing of PCBs
13	ATE functional tester	For testing of Components
14	Programmers and Program Loaders	Chip Programming Tools
15	CAD PCB designing setups	PCB designing
16	Furnace IR type for Hybrid Micro Circuits	resistance network and HMC manufacturing
17	Laser Trimming Machines	trimming of resistances for

		higher accuracy measurement
18	Wave Soldering Machines	Wave soldering of PCBs
19	Humidity Chamber	Accelerated testing for Life cycle
20	Dry Heat Test Chamber	Accelerated testing for Life cycle
21	Thermal Shock Chamber	Accelerated testing for Life cycle
22	PRO - E Mechanical Design Stations	Mechanical CAD stations
23	Spark Erosion Tool fabricating Machine	Tool fabrication and Die manufacturing
24	CNC wire Cut Tool Fabrication machine	Tool fabrication and Die manufacturing
25	CNC Milling Machine for composite tool fabrication	Tool fabrication and Die manufacturing
26	Injection Moulding Machine	Moulding of plastic parts
27	Vibration testing Machine	Vibration testing of Meter
28	Glow Wire Test machine	Testing of Plastic Material
29	Fast transient burst testing setup	Type testing of Meter
30	Short term over Current testing setup	Type testing of Meter
31	Magnetic and other tamper testing setups	Tamper Testing
32	Impulse Voltage Testing Setup	Type testing of Meter
33	Composite Environmental testing chambers	Type testing of Meter

34.00 QUALITY ASSURANCE PLAN:

34.01 The tenderer shall invariably furnish QAP as specified in Annexure - I along with his offer the QAP adopted by him in the process of manufacturing.

34.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

35.00 COMPONENT SPECIFICATION:

As per Annexure - II enclosed.

36.00 SCHEDULES:

The tenderer shall fill in the following schedules and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule `A' Guaranteed Technical particulars (As per parameters uploaded on e- Tendering site.)

Schedule `C' Tenderer's Experience

The discrepancies if any between the specification and the catalogs and/or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

If it is observed that there are deviations in the offer in Guaranteed Technical Particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

SCHEDULE - "C"

TENDERER'S EXPERIENCE

Tenderer shall furnished here list of similar orders executed /under execution for supplying single phase static energy meters by him to whom a reference may be made by purchaser in case he considers such a reference necessary.

Sr.No.	Name of client	Order No.& date	Qty. ordered	Qty. supplied

NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER _____

DESIGNATION _____

DATE _____

ANNEXURE I

Quality Assurance Plan

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

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

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

   iii. List of manufacturing facilities available.

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

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

   vi. List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly bought out in schedule of deviation from specified test requirements.

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

   i. List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished alongwith offers.

   ii. Type test certificates of the raw materials and bought out accessories if required by the purchaser.

   iii. Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

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

   i. Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's

written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

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

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

i. The structure of the organization.

The duties and responsibilities assigned to staff ensuring quality of work.

The system for purchasing taking delivery and verification of material.

The system for ensuring quality workmanship.

The system for retention of records.

The arrangement for contractor's internal auditing.

A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

ii. Quality Plans :

An outline of the proposed work and programme sequence.

The structure of the contractor's organization for the contract.

The duties and responsibilities assigned to staff ensuring quality of work.

Hold and notification points.

Submission of engineering documents required by the specification.

The inspection of materials and components on receipt.

Reference to the contractor's work procedures appropriate to each activity.

Inspection during fabrication / construction.

Final inspection and test.

ANNEXURE II

Component Specification

SR. NO.	COMPONENT FUNCTION	REQUIREMENT	MAKES
1	Measurement or computing chips	The measurement or computing chips used in the Meter shall be with the Surface mount type.	USA: Analog Devices, Cyrus Logic, Atmel, Philips, Teridian, Dallas, ST, Texas Instruments, Motorola, National semiconductor, Onsemiconductors, Maxim, Freescale. Germany: Siemens, Infineon. South Africa: SAMES. Japan: NEC, Toshiba, Renasas, Hitachi. Austria: AMS. Holland: Philips (N X P)
2	Memory chips	The memory chips shall not be affected by external parameter like sparking, high voltage spikes or electrostatic discharges. Meter shall have non volatile memory (NVM). No other type of memory shall be used for data recording and programming. (The life of the NVM is highest) There shall be security isolation between metering circuit, communication circuit,	USA: Atmel, Teridian, National Semiconductors, Texas Instruments, Philips, ST, Microchip, Spanson (Fujitsu), Ramtron. Japan: Hitachi, Renasas. Germany: Siemens

		and power circuit.	
3	Display modules	a) The display modules shall be well protected from the external UV radiations. b) The display visibility shall be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meter (refer 3.2 d for Viewing angle). c) The construction of the modules shall be such that the displayed quantity shall not disturbed with the life of display (PIN Type). d) It shall be trans-reflective HTN (HTN – Hyper Twisted Nematic (120°)) or STN (STN – Super Twisted Nematic (160°)) type industrial grade with extended temperature range. HTN – Hyper Twisted Nematic (120°) STN – Super Twisted Nematic (160°)	Singapore: Bonafied Technologies, Displaytech, E-smart. Korea: Advantek, Jebon. Japan: Hitachi, Sony, L & G. Korea: Union Display Inc. Malaysia: Crystal Clear Technology. Hongkong: Genda. China: Success, Tinma, Haijing, Truly.
4	Electronic components	The active & passive components shall be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Philips, Texas Instruments, BC Component, Analog devices, ST, Onsemiconductors, Maxim, Freescale, Intersil, Raltron, Kemet, Fairchild, Muruta, Agilent, AVX, Abracon,

			Sipex, Diode Inc, Honeywell, Power Integration, Fox, Roham. Japan: Hitachi, Oki, AVZ or Ricon, Toshiba, Epson, Kemet, TDK, Alps, Muruta, Samsung, Sanyo. India: KELTRON, Incap, VEPL, PEC, RMC, Gujarat Polyavx, Prismatic, MFR Electronic Components Pvt. Ltd, Cermet. Korea: Samsung Japan: Panasonic Germany: Vishay, Epcos, Diotech, Kemet.
5	Battery	Only non rechargeable battery shall be used for RTC as well as display in absence of Power since the life & Reliability of these are better than the rechargeable batteries.	USA: Maxell, Renata. Japan: Panasonic, Sony, Mitsubishi, Sanyo. Germany: Varta. France: Saft. Korea: Tekcell, Vitzrocell.

ANNEXURE-III

Prepayment Meter Token Process

Overview –

In online metering, billing & collection prepayment system, 21 digit token is generated to provide relevant information to meter such as credit, tariff, fixed charges, fuel adjustment charges, emergency credit, maximum load limit etc. Relevant information is encrypted using Triple data encryption system (DES) to get 20 digits code. "0" is prefixed to this 20 digits encrypted data to get 21 digit token.

Registration of meter & Security key–

Final registration scheme of the meter shall be communicated by MSEDCL to the successful bidder at the time of order / supply. For the tender, 8 digit numeric serial no. along with 64 bit security key required for decryption of tokens shall be provided by MSEDCL to prospective bidder. Bidder shall hard-code this security key into the meter firmware.

Basic Components of Token –

1. Type of Token
2. Token Index Number
3. Utility Code.
4. Token Sequence Number.
5. Data e.g. Credit / tariff / fixed charges / emergency credit / fuel adjustment charges etc.
6. CRC.

Type of Token –

S.No.	Token Type	Token Code
1.	Credit	00
2.	Load Limit	10
3.	Emergency Credit	12
4.	Fixed Charges	15
5.	FAC	19
6.	Slab Tariff	20
7.	Tariff applicable date	21

Utility Code – "0100" (4bits).

Token index number – This is a 10 bit number which gets incremented after every new token generated for a particular consumer.

Sequence number – At the time of recharge, if more than 1 token is generated, at that time this 5 bit number is used to identify the sequence in which the token is to be entered in meter.

Data – These 24 bits gives information of credit amount, tariff, FAC, fixed charges etc.

In case of credit token, the first 7 bits represent tariff no. which gets incremented with each tariff change & the balance 17 bits represent the amount in rupees.

CRC – These 16 bits are used for token integrity

Examples of tokens after Triple DES Decryption:

Credit token –

Type of Token	Token Code	Utility Code	Token Index number	Sequence number	Data		CRC	Total
					Tariff no.	Amount		
Credit	5(bits)	4(bits)	10(bits)	5(bits)	7(bits)	17(bits)	16(bits)	64(bits)

Data Information – The range of amount shall be between "1100100" (Rs. 100) to "11000011010010110" (Rs. 99990).

Slab tariff token –

For Each slab, 1 token is generated E.g. if there are 3 slabs, 3 tokens shall be generated. 1 additional token is generated for the Tariff applicable Date.

Type of Token	Token Code	Utility Code	Token Index number	Sequence number	Data	CRC	Total
Slab tariff change	5(bits)	4(bits)	10(bits)	5(bits)	24(bits)	16(bits)	64(bits)
Tariff applicable Date	5(bits)	4(bits)	10(bits)	5(bits)	24(bits)	16(bits)	64(bits)

24 bits of Data in the Slab Tariff change token consists of the slab end limit kWh with resolution of 1.0 kWh (12bits) and the tariff rate for that slab (12 Bits) with resolution of 0.01 Rs.

24 bits of Data in the Tariff applicable Date token, consists of 8 bits each of Date, month and Year (ddmmyy).

Fixed Charges token –

Type of Token	Token Code	Utility Code	Token Index number	Sequence number	Data	CRC	Total
Fixed Charges	5(bits)	4(bits)	10(bits)	5(bits)	24(bits)	16(bits)	64(bits)

Resolution of Fixed Charges is 1.0 Rs

Emergency Credit token –

Type of Token	Token Code	Utility Code	Token Index number	Sequence number	Data	CRC	Total
Emergency credit	5(bits)	4(bits)	10(bits)	5(bits)	24(bits)	16(bits)	64(bits)

Resolution is 1.0 Rs

Fuel Adjustment charges (FAC) token –

Type of Token	Token Code	Utility Code	Token Index number	Sequence number	Data	CRC	Total
FAC	5(bits)	4(bits)	10(bits)	5(bits)	24(bits)	16(bits)	64(bits)

Resolution is 0.01 Rs

Maximum Load Limit token –

Type of Token	Token Code	Utility Code	Token Index number	Sequence number	Data	CRC	Total
Load limit	5(bits)	4(bits)	10(bits)	5(bits)	24(bits)	16(bits)	64(bits)

Resolution is 1.0 Amperes. Maximum value can be 75.0 Amperes.

Number of tokens with respect to change in billing structure

1. For each slab tariff one token is generated. An additional token for tariff date applicability is also generated along with the slab tariff tokens. E.g. For a three slab tariff structure, four tokens are generated.
2. For emergency credit changes one token is generated.
3. For fuel adjustment charges changes one token is generated.

The above tokens are generated along with the next credit recharge token.

Decryption process flow chart for tokens