

GOVERNMENT OF ARUNACHAL PRADESH
DEPARTMENT OF POWER

BID DOCUMENT

PART-III
(Volume-2/3)

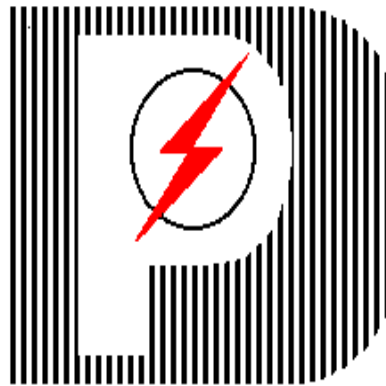
TECHNICAL SPECIFICATIONS

OF

**AUTOMATION OF ELECTRIC ENERGY METERING AND BILLING
WITH AMR AND PRE-PAID METERS IN CAPITAL COMPLEX**

UNDER

**DEPARTMENT OF POWER
GOVERNMENT OF ARUNACHAL PRADESH**



SPECIFICATION NO. DOP: AP/WEZ/CAPITAL COMPLEX//PREPAID-AMR METERING

ESTIMATED COST: RS. 8433.62 LAKHS

**CAPITAL ELECTRICAL DIVISION
ITANAGAR**

BID DOCUMENT

Part-III **(Volume-2/3)**

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SPECIFICATION NO.: DOP: AP/WEZ/CAPITAL COMPLEX/PREPAID-AMR METERING

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TECHNICAL SPECIFICATION FOR SINGLE PHASE KEYPAD PRE PAID METER

1. SCOPE:

This specification covers design, manufacture, testing and supply of single phase electronic, accuracy class 1.0 keypad Prepaid meters with split unit and provisions for TOD (Time of Day) tariff and R.T.C. (Real Time Clock).

The requirements of the online Vending/Transaction system to be provided for the keypad Prepaid metering system are also covered in the scope. The meter shall use keypad technology for the transfer of credit from the vending system to the meter. The meter shall contain the measuring element, main switch, display and keypad and comply with the requirements of the standards. The switch shall be used to disconnect customers depending on their load demand or the state of their account and shall be capable of operating over the life of the meter.

2. Separate display unit shall be provided with each meter. However recharging & parameter display facility should be available on both the units i.e. the display unit shall also have provision to enter the recharging encrypted code.

3. SPECIFICATION FOR SINGLE PHASE PRE PAID KEY PAD TYPE ENERGY METER:

3.1 STANDARD:

The meters with accuracy class -1.0 are required for measurement of Active Energy and shall conform to the latest edition of following standards:

IS: 13779	: A.C. Static Watt Hour Meters (Class-1.0 and 2.0)
CBIP Report No. 88	: Specification for AC Static Electrical Energy Meters
IS: 15884	: AC Direct Connected Static Prepaid Meters for Active Energy (Class 1 and Class 2)

3.2 BIS MARK:

The Prepaid meter should be approved as per the IS: 13779.

3.3 CLIMATIC CONDITIONS:

The meter is required to operate satisfactorily and continuously with specified accuracy under hot, dusty and tropical conditions and other climate condition specified as herein after:-

i)	Specified operating range	: -10°C to +55°C
ii)	Limit range of operation	: -25°C to +55°C
iii)	Limit range of storage and Transport	: -25°C to +70°C
iv)	RELATIVE HUMIDITY:	
	a) Annual Mean	: <75 percent
	b) For 30 days (spread over one year)	: <95 percent
	c) Occasionally on other days	: <85 percent
v)	Maximum attitude above M.S.I.	: 1000 Meter
vi)	Average Annual rain fall	: 1200 mm

3.4 CURRENT AND VOLTAGE RATING:

Rated Voltage (Vref): 240 V Phase to Neutral
 Rated Current: Basic Current 5/10/20 Amp. (Ib)
 Maximum current 30/60/80 Amp. (Imax)

3.5 VARIATION IN POWER SUPPLY:

The meters shall be suitable for working satisfactorily with the following power supply system variations:

3.5.1 VOLTAGE RANGE:

i)	Specified Operating Range	:	0.7 to 1.3 Vref (-30% to +30%)
ii)	Operating Voltage range for accuracy requirement.	:	0.85 to 1.15 Vref i.e. -15% to +15%

3.5.2 FREQUENCY VARIATION:

The standard reference frequency for performance shall be 50Hz with tolerance $\pm 5\%$.

3.6 POWER CONSUMPTION

3.6.1 VOLTAGE CIRCUIT:

The active, apparent Power consumption in voltage circuit including the power supply of the meter at reference voltage, reference temperature and reference frequency shall be 1.5 watt and 8 VA as specified in relevant IS.

3.6.2 CURRENT CIRCUIT:

The apparent Power taken by each current circuit at basic current, reference frequency and reference temperature should be 1.5 Watt and 4 VA as specified in relevant IS.

3.7 STARTING CURRENT:

The meter shall start registering the energy at 0.2% of Ib.

3.8 ACCURACY:

Class of accuracy of meter shall be 1.0 and shall conform to accuracy requirement as per specified IS.

3.9 KEYPAD PREPAID METER:

The keypad buttons shall have numbers/letters on them, which shall be clearly visible and resistant to wear. 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 ‘#’. Button ‘5’ shall have some form of physical identification (raised printing or a pip) to aid customers with poor sight.

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 buttons shall provide audible feedback when pressed with differing tones to distinguish between valid and invalid entry. The entry of codes for credit or commands associated with programming functions such as tariff change shall be via encrypted numeric codes. Code encryption / decryption must be carried out using an internationally recognized standard (e.g. Triple DES). The meter shall permit a time delay of up to 20 seconds between subsequent keystrokes.

The meter has Keypad buttons which enables the user to view various displays available on the meter. The display parameters shall be as follows:

- Days Left (based on consumption of last seven days)

- Value of recent consumption
- The currently active rates, the prices charged for consumption at each rate, and the number of units consumed at each rate and the daily charges.
- Last 5 recharge codes entered in to the meter
- “Authenticated Billing Code (ABC)”#
- The total amount vended
- Shows the Refund code
- Displays monthly consumption in Rupees / kWh
- Maximum Demand with occurrence of time and date
- Instantaneous load and the projected hourly cost of use at this load
- Date/Time, Serial no.
- Voltage, current etc.
- Key code mode for punching code in to the meter.

“Authenticated Billing Code”:

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

1. 5 digit cumulative kWh energy register.
2. Date of frozen data.
3. Credit balance, it may be positive or negative.
4. The tamper flag, which only indicates whether there is any tamper or not.

3.10 TARIFF:

The meter should be programmable for the tariff order in vogue entirely and will be updated from time to time as per the tariff order, through vending code. The MIS report will be generated by the Agency and submitted to the utility indicating list of consumers whose tariff has not been changed to new tariff.

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

- 3.10.1 Minimum charges:** Using the online vending system it shall be possible to define the minimum charge for the applicable tariff category. 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 and the monthly consumption (Amount).
- 3.10.2 Fixed Charges:** Meter shall be able to deduct fixed charges on daily basis such as meter rent, sanctioned load based charges etc. The fixed charges shall be defined using the online vending system.
- 3.10.3 Time of Day (TOD) Tariff:** The meter shall have facility for recording and storing of TOD consumption on minimum Four Tariff Rates on per day basis. It shall be possible to change the time zone for TOD recordings through the portable device or through vending system.
- 3.10.4 Slab Tariff:** The meter shall have capability for defining minimum four tariff slabs. It shall be possible to change the slabs through the portable device or through the online vending system.
- 3.10.5 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.
- 3.10.6 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.

3.11 COMMUNICATION CAPABILITY:

The meter shall be provided with an optical communication port. It shall be possible to read the meter through the optical port with held hand device.

3.12 GENERAL REQUIREMENTS:

Meter shall be designed and constructed in such a way as to avoid introducing any danger in use and under normal conditions so as to ensure specially the following:—

- Personnel safety against electric shock
- Personnel safety against effects of excessive temperature.
- Protection against penetration of solid objects, dust and water.
- Protection against spread of fire.

3.12.1 All the material used in the manufacturing of meters shall be of highest quality. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation.

3.12.2 All insulating material used in the construction of meter shall be non-hygroscopic, non ageing and of tested quality and shall conform to tests as specified in relevant Standards.

3.12.3 The meter shall be designed on application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components.

3.12.4 The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic overload of live parts in contact with them.

3.12.5 The meter shall conform to the degree of protection IP 51 against ingress of dust, moisture and vermin.

3.12.6 All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to change by ordinary handling due to exposure to air under normal working conditions.

3.12.7 The meters shall be designed such that their working remains unaffected by electromagnetic interference, electrostatic discharges and high voltage transients as specified in standard.

3.13 CONSTRUCTIONAL REQUIREMENT:**3.13.1 Meter Case:**

- a. The meter shall have completely insulated body and be of wall mounted projected type. The meter shall have a case made of unbreakable high grade fire resistant, reinforced polycarbonate or equivalent high grade engineering plastic which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the meter cover seals. The meter cover shall have at least two sealing screws, each screw having the sealing holes.
- b. The meter case shall have at least three mounting holes. Two holes for mounting screws on the terminal block sealed beneath the terminal cover and one for hanging screw on the top.
- c. The meter case shall be ultrasonically welded with the meter cover in such a way that it should not be possible to open the meter cover without damaging the cover.

3.13.2 LCD Unit:

The display unit shall be Pin type built-in liquid crystal display. The measured value(s) shall be displayed on minimum six digit Liquid Crystal display (LCD) i.e. display unit, having minimum character size of 8mm X 4mm. When the meter is not energized, the display need not be visible. Each display shall be retained for a minimum period of 2s.

3.13.3 Window:

The meter cover shall be of high grade, fire resistant, reinforced polycarbonate or equivalent high grade engineering plastic with one window made of UV stabilized, silicon coated polycarbonate or equivalent high grade engineering plastic for reading the register. The window shall be integral part of the meter cover such that it cannot be removed undamaged without breaking the meter cover.

3.13.4 Terminals and Terminals block:

- a. The terminal block shall be made from best quality non-hygroscopic, fire retardant, reinforced polycarbonate (not bakelite) or equivalent high grade engineering plastic which should form an extension of the meter case. It shall have terminal of minimum internal diameter 8.5 mm.
- b. The meter shall be provided with terminal to connect the cables. The screws shall not have pointed edge at the end of thread. The clearance and creep age distance of terminal block and tips between the terminal and the surrounding parts of metal enclosure shall be as per relevant IS standard.
- c. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.
- d. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

3.13.5 Terminal Cover:

- a. The meter terminal Block shall be provided with an extended terminal cover with independent sealing arrangement in such a way that it shall cover the terminals, the conductor fixing screws, the external conductors and their insulation i.e. no part of meter or cable accessories shall be visible from the front of the meter.
- b. When the meter is mounted, no access to the terminals shall be possible without breaking the seal of the meter terminal cover.

3.13.6 Terminal Arrangement:

A diagram of connections should be provided inside the cover the terminal block. The terminal cover shall be extended such that when it is placed in position it is not possible to approach the connections or connecting wires.

3.13.7 Name Plate Marking:

The name plate shall have following markings which shall be indelible, distinct and readable from outside the meter:—

- Manufacturer's name and/or trade mark and the place (with country) of manufacture;
- Designation of type;
- The no. of phases and no. of wires for which the meter is suitable for;
- The manufacturer's serial number and year of manufacture;
- Reference voltage;
- The basic current and the maximum current;
- The principal unit in which the meter reads;
- Meter constant;
- Class index of the meter;
- Reference Frequency;
- Guaranty period.

- Property of “**DEPARTMENT OF POWER, ARUNACHAL PRADESH**”
- Contract Agreement No. and Date.

3.14 TAMPER AND FRAUD PROTECTION:

The meter shall operate normally under the following conditions:

- 3.14.1 Phase current reversal: The meter shall record forwarded energy.
- 3.14.2 Neutral current reversal: The meter shall record forwarded energy.
- 3.14.3 Phase and neutral interchange: The meter shall record forwarded energy.
- 3.14.4 The meter shall operate normally in case the phase and neutral are swapped with neutral connected to earth.
- 3.14.5 In case the neutral is opened with earth load connected, partial phase by pass or full phase bypass the energy shall be recorded on the wire which has higher current recording. Such tampers shall be logged in the memory of the meter.
- 3.14.6 The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet) as per the values specified in standard applied on the metering system shall not affect the proper functioning and recording of energy as per error limits prescribed by standard.
- 3.14.7 **Spark Immunity:** The meter shall be immune up to 35 kV spark discharge. The meter shall be tested by feeding spark under the following manner for 10 minutes and accuracy shall be maintained:
 - a. On any of the phases or neutral terminals.
 - b. On any of the connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)
 - i. At any place in load circuit
 - ii. At any location of meter body.
- 3.14.8 **Measurement shift:** The meter shall have measuring element for both phase and neutral to avoid tampering with neutral. The energy measurement shall always be done on the element with higher current and it is preferable to supply the CT's for both phase and neutral. The meter shall detect the measurement shifting from phase to neutral circuit and neutral to phase circuit in the memory. This shall be done by finding the imbalance between phase and neutral current and comparing with the pre defined threshold and the persistence time.
- 3.14.9 **Meter Cover Open detection:** If case of meter cover/base is opened it shall log the tamper in meter memory with meter time & date.
- 3.14.10 **Magnetic Interference:** Meter shall record accurate energy in case of external magnetic influencing signals as per the IS13779. Meter shall be immune up to 0.5T permanent magnet.
- 3.14.11 If neutral is disconnected from both supply & load side the meter shall not power up and / or shall disconnect the supply.

3.15 TESTS:

3.15.1 **Type Tests**

Meter shall be fully type tested as per IS 13779/1999 (amended up to date) and external AC/DC magnetic influence tests as per CBIP Tech-Report 88. The Type Test Reports shall clearly indicate the constructional features of the type tested meters. All the Type Tests shall have been carried out from any NABL accredited Laboratories to prove that the meters meet the requirements of the specification.

3.15.2 Meters shall pass the entire acceptance and routine tests as laid down in IS: 13779/1999 (amended up to date) and also additional acceptance tests as prescribed in this specification.

3.15.3 Prepaid functionality shall be tested by the utility as per IS: 15884 / 2010.

3.15.4 Other Acceptance tests

- i) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage/problems,
- ii) Power consumption tests,
- iii) The meter shall withstand impulse voltage at 10kV.
- iv) The meters shall be tested at (-) 15% and at (-) 30% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation as per relevant IS.
- v) For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS: 13779/1999 (amended up to date).
- vi) The meter shall detect the measurement shifting from phase to neutral circuit and neutral to phase circuit in the memory. This shall be done by finding the imbalance between phase and neutral current and comparing with the pre defined threshold and the persistence time. The condition for measurement shift shall be according to below conditions and the meter shall log the forwarded energy in this conditions:

1	Interchanging of phase & neutral terminals.
2	Neutral connected on incoming side but connected to earth via resistor on outgoing side. Load is connected solidly to ground.
3	Phase & neutral interchanged at incoming and load is connected to earth.
4	Shorting is provided on current coil terminals.

- vii) Meter shall record accurate energy in case of external magnetic influencing signals as per the IS13779. Meter shall be immune up to 0.5T permanent magnet and the switch shall not operate in this condition. In case of abnormal magnetic field such as continuous DC magnetic induction of 0.27 Tesla ± 5% and magnetic induction of 10 milli Tesla the meter shall perform the following features:
 - a) Meter shall log the event in its memory as Magnetic tamper with date and time stamp.
 - b) Meter shall show “TAMPER” in the display.
 - c) Meter shall start recording at 100% of I_{max} (Defrauded metering).

3.15.5 Sample Meter:

Two nos. sample meter of Single Phase Prepaid meter must be submitted before opening of the price bid on a specified Date and Time. Sample meters shall be tested at one of the utility or any test Lab by group of our technical experts as per specification. Date of testing shall be informed to all bidders. Engineer of the bidder shall come with vending software and token generation system. Other than verification of sample meter as per IS 13779 and IS 15884, below mention tests shall also be done and bidders’ representative shall be well equipped to demonstrate desired features:-

- a) Vending system operation.
- b) Test of application of tariff.
- c) Token generation.

- d) Token punch & checking all display parameters on meter as well as parallel home display unit
- e) Balance available in the meter.
- f) Test of friendly credit hours start & end time
- g) Test of disconnect the output supply once when credit reach to zero.
- h) Test of reconnect the output supply on providing credit limit / charging with new token.
- i) Test of reconnect the out supply if load / current falls below the preset value in the meter.
- j) Test of visible / audible over load warning.
- k) Test of visible / audible low credit warning.
- l) Authentic Billing Code (ABC) verification.
- m) All tampers shall be tested as mentioned in the specification.
- n) MRI of meter for verification of tamper information with date & time stamping, load survey and meter readings.

4. CONSUMER INTERFACE UNIT (CIU):

- The meter shall be supplied with a separate In-home display unit /CIU.
- The display unit shall be powered up from the meter.
- The display unit shall have a LCD display.
- 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 an RJ11 connection port to connect to the meter.
- The display unit and 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.

5. METER DATA READ THROUGH MRI AND /OR BCS:

It shall be possible to read the prepaid meters and minimum following information shall be available in meter reading data.

- The transaction history data with date and time.
- All the events history with time based and category based information.
- Tariff details including the TOD tables, slab tables and information about the current active rate price.
- Monthly history and consumption data of the energy consumed for last twelve months.
- All the account related information like meter credit, emergency credit details, minimum charge and fixed charges value.
- All the limiting parameters shall also be available in meter reading.

TECHNICAL SPECIFICATION FOR AND THREE PHASE KEYPAD PRE PAID METER

1. SCOPE:

This specification covers design, manufacture, testing and supply of single phase electronic, accuracy class 1.0 keypad Prepaid meters with split unit and provisions for TOD (Time of Day) tariff and R.T.C. (Real Time Clock).

The requirements of the online Vending/Transaction system to be provided for the keypad Prepaid metering system are also covered in the scope. The meter shall use keypad technology for the transfer of credit from the vending system to the meter. The meter shall contain the measuring element, main switch, display and keypad and comply with the requirements of the standards. The switch shall be used to disconnect customers depending on their load demand or the state of their account and shall be capable of operating over the life of the meter.

- 2. Separate display unit shall be provided with each meter. However recharging & parameter display facility should be available on both the units i.e. the display unit shall also have provision to enter the recharging encrypted code.

3. SPECIFICATION FOR THREE PHASE PRE-PAID METER

3.1 STANDARD:

The meters with accuracy class-I are required measurement of Active Energy and shall conform to the latest edition of following standards:

IS:13779	:	A.C. Static Watt Hour Meters (Class-1 and 2)
CBIP Report No. 88	:	Specification for AC static Electrical Energy meters
IS:15884	:	AC Direct Connected Static Prepaid Meters for Active Energy (Class 1 and Class 2)

Meters meeting other authoritative standards which ensure an equal or better quality than the standard mentioned above, shall also be acceptable. All kinds of tests which are required as per mentioned standards shall be carried out.

3.2 BIS MARK:

This prepaid meters shall be approved as per the IS: 13779.

3.3 CLIMATIC CONDITIONS:

The meter shall be required to operate satisfactorily and continuously with specified accuracy under hot, dusty and tropical conditions and other climatic condition specified as hereinafter:

i)	Specified operating range	:	-10°C to + 55°C
ii)	Limit range of operation	:	-25°C to + 55°C
iii)	Limit range of storage and Transport	:	-25°C to + 70°C
iv)	RELATIVE HUMIDITY:		
	(a) Annual Mean	:	<75 percent

	(b)	For 30 days (spread over one year)	:	<95 percent
	(c)	Occasionally on other days	:	<85 percent
	v)	Maximum attitude above M.S.I.	:	1000 Meter
	vi)	Average Annual rain fall	:	1200 mm.

3.4 CURRENT AND VOLTAGE RATING:

Rated Voltage (Vref) : 3 x 240 V Phase to Phase
 Rated Current : Basic Current 10/20 Amp. (Ib)
 Maximum current 60/80 Amp. (Imax)

3.5 VARIATION IN POWER SUPPLY:

The meters shall be suitable for working satisfactorily with the following power supply system variations:—

4.5.1 Voltage Range:

(i)	Specified Operating Range	:	0.7 To 1.3 Vref.(-30% to +30%)
(ii)	Operating voltage range for accuracy requirement	:	0.85 to 1.15 Vref i.e. -15% to + 15%

4.5.2 Frequency Variation:

The standard reference frequency for performance shall be 50Hz with tolerance $\pm 5\%$.

3.6 POWER CONSUMPTION:

3.6.1 Voltage Circuit:

The active, apparent Power consumption in voltage circuit including the power supply of the meter at reference voltage, reference temperature and reference frequency should be 1.5 Watt and 8 VA in conformation to relevant IS.

3.6.2 Current Circuit:

The apparent Power taken by each current circuit at basic current, reference frequency and reference temperature should be 1.5 Watt and 4 VA in conformation to relevant IS.

3.7 STARTING CURRENT:

The meter should start registering the energy at 0.2% of Ib

3.8 ACCURACY:

Class of accuracy of meter shall be 1.0 and shall confirm to accuracy requirement as per specify IS.

3.9 KEYPAD PREPAID METER:

The keypad buttons shall have numbers/letters on them, which shall be clearly visible and resistant to wear. 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 '#'. Button '5' shall have some form of physical identification (raised printing or a pip) to aid customers with poor sight.

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 buttons

shall provide audible feedback when pressed with differing tones to distinguish between valid and invalid entry. The entry of codes for credit or commands associated with programming functions such as tariff change shall be via numeric codes. Code encryption/decryption must be carried out using an internationally recognized standard (i.e. Triple DES). The meter shall permit a time delay of up to 20 seconds between keystrokes.

The meter has Keypad buttons which enables the user to view various displays available on the meter. The displays parameters shall be as follows:

- Days Left (based on consumption of last seven days)
- Value of recent consumption
- The currently active rates, the prices charged for consumption at each rate, and the number of units consumed at each rate and the daily charges.
- Last 5 recharge codes entered in to the meter
- “Authenticated Billing Code (ABC)”#
- The total amount vended
- Shows the Refund code
- Displays monthly consumption in Rupees / kWh
- Maximum Demand with occurrence of time and date
- Instantaneous load and the projected hourly cost of use at this load
- Date/Time, Serial no.
- Voltage, current etc.
- Key code mode for punching code in to the meter

“Authenticated Billing Code”:

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

1. 5 digit cumulative kWh energy register.
2. Date of frozen data.
3. Credit balance, it may be positive or negative.
4. The tamper flag, which only indicates whether there is any tamper or not.

3.10 TARIFF:

The meter should be programmable for the tariff order in vogue entirely.

Following are the features required in meter for Tariff.

- 3.10.1 **Minimum Charges:** Using the vending system it shall be possible to define the minimum charge for the applicable tariff category. 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 and the monthly consumption (Amount).
- 3.10.2 **Fixed Charges:** Meter shall be able to deduct fixed charges on daily basis such as meter rent, sanctioned load based charges etc.
- 3.10.3 **Time of Day (TOD) Tariff:** The meter shall have facility for recording and storing of TOD consumption on minimum Four Tariff Rates, per day basic. It should be possible to change the time period for TOD recordings through the portable device or through the online vending system.
- 3.10.4 **Slab Tariff:** The meter shall have capability for defining minimum four tariff slabs. It shall be possible to change the slabs through the portable device or through the online vending system.
- 3.10.5 **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.
- 3.10.6 **Debt:** 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.

3.11 COMMUNICAITON CAPABILITY:

The meter shall be provided with a optical communication port. It shall be possible to read the meter through the optical port with the help of Hand Held Unit.

3.12 GENERAL REQUIREMENTS:

- 3.12.1** Meter shall be designed and constructed in such a way as to avoid introducing any danger in use and under normal conditions so as to ensure specially the following:—
- Personnel safety against electric shock
 - Personnel safety against effects of excessive temperature.
 - Protection against penetration of solid objects, dust and water.
 - Protection against spread of fire.
- 3.12.2** All the material used in the manufacture of meters shall be of highest quality. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation.
- 3.12.3** All insulating material used in the construction of meter shall be non-hygroscopic non ageing and of tested quality and shall conform to tests as specified in relevant Standards.
- 3.12.4** The meter shall be designed on application specific integrated circuit and shall be manufactured using SMT (Surface Mount Technology) components.
- 3.12.5** The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They should not be ignited by thermic overload of live parts in contact with them.
- 3.12.6** The meter shall conform to the degree of protection IP 51 against ingress of dust, moisture and vermin.
- 3.12.7** All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to change by ordinary handling due to exposure to air under normal working conditions.
- 3.12.8** The meters shall be designed such that their working remains unaffected by electromagnetic interference, electrostatic discharges and high voltage transients as per standard.

3.13 CONSTRUCTIONAL REQUIREMENTS:**3.13.1 Meter Case:**

- a. The meter shall have completely insulated body and be of wall mounted projected type. The meter shall have a case made of unbreakable high grade fire resistant, reinforced polycarbonate or equivalent high grade engineering plastic which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the meter cover seals. The meter cover shall have at least two sealing screws each screw having the sealing holes.
- b. The meter case shall have at least three mounting holes. Two holes for mounting screws on the terminal block sealed beneath the terminal cover and one for hanging screw on the top.

3.13.2 LCD Unit:

The display unit shall be Pin type built-in liquid crystal display. The measured value(s) shall be displayed on minimum six digit Liquid Crystal display (LCD) display unit, having minimum character size of 8mm X 4mm. When the meter is not energized, the display need not be visible. Each display shall be retained for a minimum period of 2s.

3.13.3 Window:

The meter cover shall be of high grade, fire resistant, reinforced polycarbonate or equivalent high grade engineering plastic with one window made of UV stabilized, silicon coated polycarbonate or equivalent high grade engineering plastic for reading the register. The window shall be of transparent material ultrasonically welded with the meter cover such that it cannot be removed undamaged without breaking the meter cover.

3.13.4 Terminals and Terminals block:

- a. The terminal block shall be made from best quality non-hygroscopic, fire retardant, reinforced polycarbonate (not bakelite) or equivalent high grade engineering plastic which should form an extension of the meter case. It shall have terminal minimum internal diameter 8.5mm
- b. The meter shall be provided with terminals to connect the cables. The screws shall not have pointed edge at the end of thread. The clearance and creep age distance of terminal block and tips between the terminal and the surrounding parts of metal enclosure shall be as per IS.
- c. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.
- d. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

3.13.5 Terminal Cover:

- a. The meter terminal Block shall be provided with an extended terminal cover with independent sealing arrangement in such a way that it shall cover the terminals, the conductor fixing screws, the external conductors and their insulation i.e. no part of meter or cable accessories shall be visible from the front of the meter.
- b. When the meter is mounted, no access to the terminals shall be possible without breaking the seal of the meter terminal cover.

3.13.6 Terminal Arrangement:

A diagram of connections should be provided inside the cover of the terminal block. The terminal cover shall be extended such that when it is placed in position it is not possible to approach the connections or connecting wires.

3.13.7 Name Plate Marking:

The name plate shall have following markings which shall be indelible, distinct and readable from outside the meter:—

- Manufacturer's name and/or trade mark and the place of manufacture;
- Designation of type;
- The no. of phases and no. of wires for which the meter is suitable for;
- The manufacturer's serial number and year of manufacture;
- Reference voltage;
- The basic current and the maximum current;
- The principal unit in which the meter reads;
- Meter constant;
- Class index of the meter;
- Reference Frequency;
- Warranty Period
- Property of "DEPARTMENT OF POWER, ARUNACHAL PRADESH"
- Contract Agreement No. and Date

3.14 TAMPER AND FRAUD PROTECTION:

- 3.14.1 Phase Sequence Reversal:** The meter should work accurately irrespective of phase sequence of the supply.
- 3.14.2 C.T. Shorting / By Passing:** The meter shall have capability to record bypassing/shorting and opening of current coil (s) of one or any two phases with date, time. Meter shall not disconnect the supply under CT bypass or open.
- 3.14.3 Missing Potential:** The meter shall be capable of detecting and recording occurrences and restorations of missing potential (1 phase or 2 phases) which can happen due to intentional/accidental disconnection of potential leads with date and time along with total no. of such occurrences for all phases during the above period. This tamper recording shall not be done when meter is without any load i.e. current in all phases is zero.
- 3.14.4 External Magnetic Influence:** The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet) as per the values specified in standard applied on the metering system shall not affect the proper functioning and recording of energy as per error limits prescribed in standard.
- 3.14.5 Meter Cover Open detection:** If case of meter cover/base is opened it shall log the tamper in meter memory with date & time stamp.
- 3.14.6 Spark Immunity:** The meter shall be immune up to 35 kV spark discharge. The meter shall be tested by feeding spark under the following manner for 10 minutes and accuracy shall be maintained:
- On any of the phases or neutral terminals.
 - On any of the connecting wires of the meter (Voltage discharge with 0-10 mm spark gap)
 - At any place in load circuit
 - At any location of meter body.
- 3.14.7 Magnetic Interference:** Meter shall record accurate energy in case of external magnetic influencing signals as per the IS13779. Meter shall be immune up to 0.5T permanent magnet and the switch shall not operate in this condition.

3.15 TESTS:

3.15.1 Type Tests

Meter shall be fully type tested as per IS 13779/1999 (amended up to date) and external AC/DC magnetic influence tests as per CBIP Tech-Report 88. The Type Test Reports shall clearly indicate the constructional features of the type tested meters. 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 to prove that the meters meet the requirements of the specification.

- 3.15.2** Prepaid functionality shall be tested by the utility as per IS: 15884 / 2010.
- 3.15.3** Meters shall pass the entire acceptance and routine tests as laid down in IS:13779 (amended up to date) and also additional acceptance tests as prescribed in this specification.
- 3.15.4** Other Acceptance tests:
- 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,
 - Power consumption tests,
 - The meter shall withstand impulse voltage at 10kV.
 - The meters shall be tested at (-) 15% and at (-) 30% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation indicated above.
 - For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS: 13779/1999 (amended up to date).
 - Meter shall record accurate energy in case of external magnetic influencing signals as per the IS13779. Meter shall be immune up to 0.5T permanent magnet and the switch

shall not operate in this condition. In case of abnormal magnetic field such as continuous DC magnetic induction of 0.27 Tesla \pm 5% and magnetic induction of 10 milli Tesla the meter shall perform the following features:

- a) Meter shall log the event in its memory as Magnetic tamper with date and time stamp.
- b) Meter shall show "TAMPER" in the display.
- c) Meter shall start recording at 100% of I_{max} (Defrauded metering).

3.15.5 Sample Meter:

Two nos. sample meter of Three Phase Prepaid meter must be submitted before opening of the price bid on a specified Date and Time. Sample meters shall be tested at one of the utility or any test Lab by group of our technical experts as per specification. Date of testing shall be informed to all bidders. Engineer of the bidder shall come with vending software and token generation system. Other than verification of sample meter as per IS 13779 and IS 15884, below mention tests shall also be done and bidders' representative shall be well equipped to demonstrate desired features:-

- a) Vending system operation.
- b) Test of application of tariff.
- c) Token generation.
- d) Token punch & checking all display parameters on meter as well as parallel home display unit
- e) Balance available in the meter.
- f) Test of friendly credit hours start & end time
- g) Test of disconnect the output supply once when credit reach to zero.
- h) Test of reconnect the output supply on providing credit limit / charging with new token.
- i) Test of disconnect the out supply if load / current exceed the preset value in the meter.
- j) Test of reconnect the out supply if load / current falls below the preset value in the meter.
- k) Test of visible / audible over load warning.
- l) Test of visible / audible low credit warning.
- m) Authentic Billing Code (ABC) verification.
- n) All tampers shall be tested as mentioned in the specification.
- o) MRI of meter for verification of tamper information with date & time, load survey and meter readings.

4. CONSUMER INTERFACE UNIT (CIU):

- The meter shall be supplied with a separate In-home display unit /CIU.
- The display unit shall be powered up from the meter.
- The display unit shall have a LCD display.
- 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 an RJ11 connection port to connect to the meter.
- The display unit and 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.

5. METER DATA READ THROUGH MRI AND /OR BCS:

It shall be possible to read the prepaid meters and minimum following information shall be available in meter reading data.

- The transaction history data with date and time.
- All the events history with time based and category based information.
- Tariff details including the TOD tables, slab tables and information about the current active rate price.
- Monthly history and consumption data of the energy consumed for last twelve months.

- All the account related information like meter credit, emergency credit details, minimum charge and fixed charges value.
- All the limiting parameters shall also be available in meter reading.

TECHNICAL SPECIFICATION FOR VENDING SYSTEM:**1 SCOPE:**

This section specifies the requirements of the vending system for currency based Prepaid metering solution.

2 VENDING SYSTEM REQUIREMENTS:

The meter shall work on the latest currency transfer keypad technology supported by an online vending system. Since the keypad technology is future proof, cost effective and in this communication age, enables consumers to buy electricity over the multiple vending options like Utility billing centers, Utility website, through third party POS providers and SMS based vending and many other vending options such as IVR (Utility Call Centre), bank ATM, etc which enables 24x7 anywhere anytime vending faculties, hence the system provided by the bidder shall have such capabilities to integrate with utility / any third party service providers.

The vending system shall use Triple Data Encryption Standard (Triple DES), i.e. it provides three levels of encryption for the vend code. The code shall be meter specific and can't be used in any other meter. Triple DES is widely used in banking systems worldwide due to the high level of security provided by the algorithm.

The necessary licensed Software for each Vending Station at Utility billing centre shall be provided by bidder.

The vending station shall be placed at the billing stations of Utility for which necessary office space, electricity etc. and furniture for this system shall be provided by Utility. Cash shall be collected by Utility 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. The token shall be printed using the printer attached to the personal computer. Also the VPN connectivity for access between the vending station placed at Utility premises & the bidder's server shall be provided by Utility. Adequate back up power in the form of suitable UPS with standard back up shall be provided at each Vending Station.

The vending system shall be the online vending system from where the vend codes shall be issued. It shall be possible to integrate various vending options like SMS based vending, POS terminals based vending, etc. A client system shall be provided in the project monitoring center to produce the MIS reports and defining the customers in the database as mentioned in this specification.

In order to have vending system interoperable provision to integrate the prepaid system with the utility's website & payment gateway through web services technology should be made available.

3. VENDING PROCESS:

- 3.1** 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 premise number.
- 3.2** The vend terminal shall send the request to a central database that shall authenticate the transaction and generate an encrypted code.
- 3.3** In order to provide maximum security to the system the encryption shall not be done on the vend terminal.
- 3.4** On receipt of each request the vend terminal shall connect to the central database and get the code generated.
- 3.5** The code hence generated shall be printed on paper using the attached printer.

- 3.6 The vending system shall be used to transfer current values (Rupees) to the meter.
- 3.7 The consumer shall pay the money at the vend terminal, this information when fed to the vend terminal shall be send to the central database that shall encrypt the token using Triple DES encryption algorithm.
- 3.8 The vending process shall be made available by the bidder in the following manner for the consumers to generate the token.
- Vend Terminals.
 - Department of power website with e-transaction Credit/Debit Card/Net Banking.
 - SMS vending with phone banking facility.
 - Vending through assigned Bank of Department of Power.
- 3.9 The entire vending system and associated software shall be installed in the server's of the owner's Data Centre or the entire system be given on lease on AMC basis or Token Basis as may be agreed in the agreement.

4.0 DATA MONITORING CENTRE (DMC):

The DMC shall be a part of the vending system which shall have capability to interface with the central database and produce the management reports as detailed in the specification. 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.

Various tasks that should be performed from the DMC are outlined below:

- 4.1 Consumer Database Management
- Entry of new consumers and their details
 - Existing consumer database
- 4.2 Meter Database Management
- Uploading of meter database
- 4.3 Tariff Management
- Tariff structure definition
 - Rate Price definition
 - Tariff category
 - Tax percentage
 - Fixed Charge value
 - Minimum charge value
 - Slab reset period
 - Tariff change administration
- 4.4 Limit Parameters management
- Define Load Limit
 - Current Limit value
 - Emergency Credit
- 4.5 Debt (previous charges) Management
- 4.6 Transaction management :
- Cash vend transaction
 - Retained credit transaction
 - Refund Money Transaction
 - Previous Charge Transaction
- 4.7 Reports
- Debt collection and outstanding report
 - Tax and duties accounts report
 - Customer's Vend Report

- 4.8 Import of data by the vending station from the master station / Export of data by the main station to the vending stations:
 - Import of data from Comma separated values(CSV) format files.
 - Export of data in CSV format.
- 4.9 Message Management
 - Entry of System Message.
 - Entry of Customer Specific Messages.
 - Entry of Predefined Messages.
- 4.10 User Security Management
 - Group rights definition
 - Entry of system users and allocation of group rights

5.0 SECURITY ASPECT:

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

- a) The token 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. The token generated shall be meter specific and shall be used only on the particular meter for which it is intended.
- c) The token shall not be reusable
- d) The token shall be re-issued in case it is lost the meter shall accept the code generated only once.
- e) Whenever a tariff change takes place no other token shall be accepted by the meter unless the updated tariff token is entered into the meter.
- f) The token generated shall be authenticated as well as encrypted so that no decoding is possible.
- g) The Vending system must be certified to ISO/IEC 27001 which is the only auditable international standard which defines the requirements for an Information Security Management System (ISMS). The standard is designed to ensure the selection of adequate and proportionate security controls.

6.0 System requirement for vending:

S. No.	Component	Specification	Quantity
1	Desktop PC	Minimum 2GB RAM, minimum 80 GB HDD, Windows XP or Above	Depends on No. of Vending stations.
2	UPS	1KVA	Depends on No. of Vending stations.
3	Receipt printer	Serial / Parallel	Depends on No. of Vending stations.
4	Report printer	Parallel printer	Depends on No. of Vending stations.
5	Fire wall		For every vending station.
6	Internet Connectivity		For every vending station to be provided by Utility.
7	RJ11 communication cable	4 core cable	As per in home display unit quantity

**TECHNICAL SPECIFICATION FOR PILFER PROOF METER BOX FOR
SINGLE PHASE AND THREE PHASE PREPAID ENERGY METER.**

1. SCOPE:

The meter box shall be intended to house one number Single Phase/Three Phase whole Pre-paid energy meter. The meter box complies with relevant Indian standard IS: 14772:2000/IS: 13410/other applicable standard with latest amendment.

2. MATERIALS:

- a. The meter box shall be made SMC (Thermosetting Plastic) / Engineering Plastic material which compiles following properties:
- b. Meter box shall be weather proof, capable to withstanding temperatures of Glow wire test at 650°C as per IS: 11000. HDT of meter box material shall be minimum 85° C.

3. CONSTRUCTION:

The meter box shall have roof tapering down to both the sides for easy flow of rainwater. The thickness of the box shall be minimum 2.0 mm on all sides. The over all dimensions of the box shall be such that a minimum 30 mm clearance from left , right and top, 25 mm from front and 10mm from back side & 75 mm from meter terminals and bottom side shall be maintain in between meter and box surface.

- a. The box cover shall be fixed with concealed hinge. It would be open by at least 120 degrees.
- b. Soft rubber gasket shall be provided all around the periphery of box for protection against ingress of dust and water inside the box.
- c. Meter Box shall comply IP protection class with IP - 54.
- d. Handle shall be provided on the box door for ease of door opening.
- e. For holding and sealing the door, 2 Nos. U-shaped clamps shall be provide. These clamps/latches would hold the box cover with base.
- f. All metallic parts would be well protected against corrosion.

g. Colour and Mounting :

Offered Meter box's base and cover shall be of Off White / Gray colour.

Box shall have 4 nos. holes of 6 mm diameter for fixing the meter box on wall / wooden board.

h. Cable Entry:

Suitable provision shall be provide at the bottom side of the meter box bottom for cable inlet & outlet and the same shall be capable of accommodating cable of 22- 26 mm diameter, engineering plastic cable gland shall be provide.

i. Name plate:

Printed metallic name plate shall have details of Contract Agreement No. & Date. It shall be fixed with rivet such that it cannot be removed easily.

4. TESTS FOR BOXES:

The following tests are to be conducted on the box at any independent NABL accredited laboratory and test reports shall be carried out as per relevant Indian Standard.

- Test of HDT minimum 85° C
- Test for mechanical strength
- Glow wire test at 650°C as per IS: 11000

5. ACCEPTANCE TEST:

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter, and ensuring ease of connecting and reading the meter.

Technical Specification of communication wire.

The communication wire should be four core 0.643 mm PVC insulated wire conforming to IS 694.

Technical Specification of Conduit pipe/ casing

Conduit pipe / casing should be of good quality PVC make of ½ inch dia or width. It should be ISI mark.

TECHNICAL SPECIFICATION FOR AC 3 PHASE 4 WIRE CT-PT OPERATED AND AMR COMPATIBLE TRI VECTOR ENERGY METER FOR HT CONSUMERS.

1. OBJECTIVE & SCOPE:

1.1 This specification shall cover design, engineering, manufacture, assembly, inspection, testing at manufacturers works before dispatch, packing, supply and delivery at destination (including transit insurance), 0.5 S accuracy class fully static 3 phase-4 wire CT-PT operated /CT operated and AMR compatible tri-vector energy meter along with other metering accessories such as metering cabinet, CTs and PTs of relevant accuracy class etc. detailed out in the specification. The meter shall be suitable for measurement of different electrical parameters as per the energy and power demand requirement in an AC balanced/unbalanced system over a power factor range of zero lag to unity to zero lead. These meters should have communication port to interface for remote meter reading (AMR Compatible).

2. APPLICATION:

a) HT consumers – 0.5s class

3. WORKING ENVIRONMENT:

As per IS 14697-1999 (reaffirmed 2004). Meter to perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS)

IP51 housing for indoor use and IP55 degree of protection and sealing arrangement for outdoor use.

The meter shall be suitable designed for satisfactory operation under the hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish, which provided suitable protection to them from any injurious effect of excessive humidity.

4. SERVICE CONDITION:

The meter shall be suitable for satisfactory continuous operation under the following tropical conditions:-

a) Maximum ambient temperature	:	45 °C
b) Relative Humidity	:	10 to 99 %(condensing)
c) Maximum annual rainfall	:	2500 mm'
d) Maximum wind velocity	:	47 m/sec
e) Maximum altitude above mean sea level	:	up to1500 meters
f) Isoceraunic level	:	60 days/year
g) Seismic level (Horizontal acceleration)	:	Zone -V
h) Average number of thunderstorms/annum	:	40 (5 months)
i) Minimum ambient air temperature	:	-10°C

The climate varies from cold to moderately hot and humid, conducive to rust and fungus growth. The climatic conditions are also prone to wide variations in the ambient conditions. Fog is also present in atmosphere. Lighting also occurs during rainy season.

5. APPLICABLE STANDARDS:

Unless otherwise stated elsewhere in this specification the energy meter shall be of accuracy Class 0.5 S for active/reactive /apparent energy and conform to relevant clauses of following standards or report to be read with up to date and latest amendments/revision thereof in all respect: -

1. Guidelines on “Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification” related to IEC 62056 series of standards;
2. IS-14697/1999 (reaffirmed 2004) Specification for AC Static Transformer operated Watt Hour & VAR-Hour meters (class 0.5S & 0.2 S);
3. IS-15707 Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice;
4. CBIP Report No. 88 /No. 304: Specification for AC Static Electrical Energy Meters.

The equipment meeting with the requirements of other authoritative standards, which ensure equal or better quality than the standard mentioned above, also shall be considered; in case of conflict related with communication protocol, the Guidelines on “Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification” shall prevail upon.

6. GENERAL TECHNICAL REQUIREMENT:

1	TYPE	AMR Compatible Static, 3 Ph, 4 Wire Tri-Vector Energy Meter for HT consumers.
2	FREQUENCY	50 Hz $\pm 5\%$
3	ACCURACY CLASS	0.5S
4	SECONDARY VOLTAGE	Suitable for operation from 110V Ph-Ph or 63.5V Ph-N (for HT)
5	BASIC CURRENT (I_b)	1 Amps or 5 Amp.
6	MAXIMUM CONTINUOUS CURRENT	2.0 I _b ; Starting and Short time current shall be as per IS-14697
7	POWER CONSUMPTION	i) The active and apparent power consumption, in each voltage circuit, at reference voltage, reference temperature and reference frequency shall not exceed 1.5 W and 8 VA. ii) The apparent power taken by each current circuit, at basic current, reference frequency and reference temperature shall not exceed 1.0 VA
8	POWER FACTOR	0.0 Lag -Unity- 0.0 Lead
9	DESIGN	Meter shall be designed with application specific integrated circuit (asic) or micro controller; shall have no moving part; electronic components shall be assembled on printed circuit board using surface mounting technology; factory calibration using high accuracy (0.05 class) software based test bench. Assembly of electronic components shall be as per ANSI/IPC-A-610 standard.
10	Communication port	Companion Specification for IEC 62056 series of standards, DLMS/COSEM compliant.

7. GENERAL ELECTRICAL REQUIREMENT:

7.1 STARTING CURRENT:

The meter shall start and continue to register at the current 0.1% of I_b.

7.2 RUNNING WITH NO LOAD:

When the 115% of rated voltage is applied with no current flowing in the current circuit, the meters shall not register any energy and test output of the meter shall not be more than one pulse/count on "no load".

7.3 POWER SUPPLY VARIATION:

The extreme power supply variation (which an operating meter should withstand without damage and without degradation of its meteorological characteristics when it is subsequently operated under its operating conditions) is as follows.

Voltage	: 70% to 120 % of Vref
Frequency	: 50 Hz with $\pm 5\%$ tolerance

The manufacturer can also offer meters, which can withstand higher variations.

7.4 ACCURACY:

The class of accuracy of the meter shall be 0.5S. The accuracy should not drift with time.

7.5 POWER CONSUMPTION:

The active and apparent power consumption in each voltage circuit of the CT PT Operated meters at reference voltage; temperature and frequency shall not exceed 1.5 W and 8 VA per phase respectively.

The apparent power consumption in each current circuit for the CT PT Operated meters at basic current, reference frequency and reference temperature shall not exceed 1.0 VA per phase.

8. PERFORMANCE UNDER INFLUENCE QUANTITIES:

The meters performance under influence quantities shall be governed by IS 14697-1999 (reaffirmed 2004). The meter should be designed and protected such that all external effects and influences shall not change its performance & shall work satisfactorily within guaranteed accuracy limits, as specified in IS 14697(latest version).

9. MANUFACTURING PROCESS, ASSEMBLY AND TESTING:

Meters shall be manufactured using latest and 'state of the art' technology and methods prevalent in electronics industry. The meter shall be made from high accuracy and reliable surface mount technology (SMT) components. All inward flow of major components and sub assembly parts (CT, PT, RTCs/Crystal, LCDs, LEDs, power circuit electronic components etc.) shall have batch and source identification. Multilayer 'PCB' assembly with 'PTH' (Plated through Hole) using surface mounted component shall have adequate track clearance for power circuits. SMT component shall be assembled using automatic 'pick-and-place' machines, Reflow Soldering oven, for stabilized setting of the components on 'PCB'. For soldered PCBs, cleaning and washing of cards, after wave soldering process is to be carried out as a standard practice. Assembly line of the manufacturing system shall have provision for testing of sub-assembled cards. Manual placing of components and soldering, to be minimized to items, which cannot be handled by automatic machine. Handling of 'PCB' with ICs/C-MOS components, to be restricted to bare minimum and precautions to prevent 'ESD' failure to be provided. Complete assembled and soldered PCB should undergo functional testing using computerized Automatic Test Equipment.

Fully assembled and finished meter shall under go 'burn-in' test process for 24 Hours at 55 degree Celsius (Max. temperature to not exceed 60 degree Celsius) under base current (I_b) load condition.

Test points should be provided to check the performance of each block/stage of the meter circuitry.

RTC shall be synchronized with NPL time at the time of manufacture. Meters testing at intermediate and final stage shall be carried out with testing instruments, duly calibrated with reference standard, with traceability of source and date.

10. GENERAL & CONSTRUCTIONAL REQUIREMENTS:

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc, shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance under all conditions especially during extreme cold/storms/heavy rains/very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter become inaccessible.

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

- a) Personal safety against electric shock
- b) Personal safety against effects of excessive temperature.
- c) Protection against spread of fire
- d) Protection against penetration of solid objects, dust & water
- e) Protection against fraud
- f) Protection against pilferage
- g) Meter base and cover shall be joined with ultrasonic welding in addition to use of directional screws.

10.2 The meter should be housed in a safe, high grade engineering plastic / polycarbonate casing, which is of projection mounting type and is dust/moisture proof, conforming to IP-51 & IP 55 of BIS 12063 / IEC 529, vermin proof and sturdy. (For LT CT Operated meter only)

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

10.4 The meter shall be supplied with a transparent extended terminal block cover (ETBC). The meter base, meter cover, terminal block and ETBC shall be made of unbreakable high grade fire resistant non-flammable reinforced, polycarbonate (not bakelite) or equivalent high grade engineering plastic, which should form an extension of meter cases and have terminal holes and shall be of sufficient size to accommodate insulation of the conductors, meeting the requirement of IS 14697.1999 / CBIP.88.

The extended terminal block cover should be separately sealable at two places and housed at the bottom of the meters and once sealed should prevent unauthorized tampering.

The terminal block should have sufficient insulating properties, mechanical strength and should have house plated solid brass/steel terminals with two fixing screws per terminal. The terminals should be designed to withstand high overload with cage clamp.

- 10.5** The meter shall have an operation indication device such as a blinking LED. The operation indicator shall be visible from the front window and capable of being monitored conveniently with suitable testing equipment.
- 10.6** The meter-base, meter cover, terminal block and ETBC shall be made of unbreakable, high grade, fire resistant, reinforced, non-flammable, polycarbonate or equivalent high grade and good quality engineering plastic certified by CIPET
- 10.7** The meter cover shall have one window. The window shall be of transparent, high-grade engineering plastic certified by CIPET for easily reading all the displayed values/parameters, nameplate details and observation of operation indicator. The window shall be ultrasonically welded with the meter cover such that it cannot be removed undamaged without breaking the meter cover seals.
- 10.8** The terminal block, the ETBC 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.
- 10.9** The meter shall have tin plated brass/steel terminals with cage clamp design. The terminals shall have suitable construction with barriers and cover to provide firm and safe connection of current and voltage leads of stranded copper conductors or copper reducer type terminal ends (thimbles).
- 10.10** The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. The internal diameter of the terminal holes shall be 5.5 mm minimum. The clearance and creepage distance shall conform to relevant clause of IS 14697:1999/CBIP technical report No.88.
- 10.11** The entire construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.
- 10.12** Bidder will submit predefined copies (Qty. indicated in Bid Proposal Sheets) of all the software's (meter reading software for HHU/CMRI, Base computer software for meter data analysis and technical details).
- 10.13** It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.
- 10.14** The meter shall have three fixing holes, one at the top and two at the bottom. The top hole shall be provided with a special clip at the back of the meter so that holding screw is not accessible to the consumer

after fixing the meters. The lower fixing screws shall be provided under the sealed terminal cover. The requisite fixing screws shall be supplied with each meter.

11. TROPICAL TREATMENT:

All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions. Meters shall withstand solar radiation. The meters shall be suitably designed and treated for normal life & satisfactory operation under the extreme cold, hot and hazardous tropical climatic conditions as specified in clause no. 4. The meter shall work from -10°C to +55°C and RH 95% non-condensing type.

12. QUALITY:

Overall the quality of the meter should be good and the service life of the meter shall be more than the guarantee period. The material, components used for manufacturing the meter shall be of premium quality. The LCD display shall not fade with time and the display annunciators should be visible. Functionality of the meter shall not be affected by the harsh environmental conditions. Quality meters shall be given preference and the performance of previous installed meters shall be analyzed before awarding the tender. Aesthetically, the meter shall be of premium quality.

13. PERFORMANCE GUARANTEE:

The meter shall have a design to operate satisfactory for 10 years under normal electrical condition and guaranteed life of 60 months from the date of commissioning against manufacturing and design defects. The meters found defective within guaranteed period should be replaced/repaired by supplier free of cost within one month of intimation.

14 SEALING OF METER:

Reliable sealing arrangement should be provided to make the meter tamper proof and avoid fiddling or tampering by unauthorized persons. For this, at least two no. of seals on meter body, two no. of seals on meter terminal cover and one no. of seal on communication port shall be provided. All the seals shall be provided in front side only as per the prevailing technical specification for sealing system.

15. MARKING OF METERS:

The marking of meters shall be in accordance with IS: 14697 /1999 (reaffirmed 2004). Every meter shall have nameplate beneath the meter cover such that the nameplate cannot be accessed without opening the meter cover and without breaking the seals of the meter cover and the nameplate shall be marked distinctly and indelibly. The basic marking on the meter nameplate shall be as follows:

- a) 100% metering Project(Details to be given later)
- b) Manufacturer's name & trade mark
- c) Type Designation
- d) No. of phases & wires
- e) Serial number

- f) Month and Year of manufacture
- g) Reference Voltage
- h) Rated secondary Current of CT
- i) Reference Standard: IS 14697
- j) Principal unit(s) of measurement
- k) Meter Constant (imp/kwh, kvARh,KVAh)
- l) Class index of meter
- m) "Property of "DEPARTMENT OF POWER, ARUNACHAL PRADESH"**
- n) Contract Agreement No. and Date
- o) Guarantee period

The meter shall also store name plate details as given in the table A5.1 of annexure of the guideline document. These shall be readable as a profile as and when required.

16. CONNECTION DIAGRAM:

The connection diagram of the meter shall be clearly shown for 3 phase 4 wire system & 3phase 3 wire system, on inside portion of the terminal cover. The meter terminals shall also be marked and this marking should appear in the above diagram.

17. COMMUNICATION CAPABILITY:

The meter shall be provided with two ports for communication of the measured/collected data as per the guideline document for DLMS/COSEM energy meters:

a) LOCAL COMMUNICATION PORT:

The energy meter shall have a galvanically isolated optical communication port located in front of the meter and complying with the hardware specifications detailed in IEC-62056-21 for data transfer to or from a hand held DLMS compliant Data Collection Device (Lap top computer, Common Meter Reading Instrument, Hand Held Units etc.) with proper security and without error.

b) REMOTE COMMUNICATION PORT:

Meter shall have an additional communication port (RS 232/485) for periodic data transfer by remote access through suitable modem (GPRS/ GSM/ EDGE/ CDMA/ PSTN/ LPR). Meter shall operate on open DLMS protocol and will be individually addressable. Meters with similar kind of RS 485 ports shall be possible to hook up in multi-drop arrangement for exporting data to the remote end server through suitable communication medium. Both ports shall support the default and minimum baud rate of 9600 bps.

18. DATA COLLECTION DEVICE:

To enable local reading of meters data a DLMS compliant data collection device (HHU, CMRI, Laptop etc;) shall be used. It shall be compatible to the DLMS compliant energy meters that are to be procured /supplied on the basis of this specification. This device shall be supplied by the meter manufacturer along with the meter free of cost (one unit per 50 meters).

19. QUANTITIES TO BE MEASURED AND DISPLAYED:

The meter shall be capable of measuring and displaying the following electrical quantities within specified accuracy limits for poly-phase balanced or unbalanced loads:

- a) Instantaneous Parameters such as phase and line voltages, currents, power factors, overall kVA, kW, kVA_r, power factor, frequency etc as per details given in the table below and the guideline document annexure.
- b) Block Load Profile Parameters such as kVAh, kWh, kVA_rh (lag, lead), Maximum Demand (MD) in kW & kVA, power factor, phase and line voltages, currents etc as per details given in the table below and the guideline document annexure.
- c) Daily Load Profile Parameters such as cumulative energy kWh (import, export), cumulative kVAh (while kW-import/export), cumulative energy kVA_rh (quadrant-1/2/3/4), reactive energy high (V>103%)/low (V<97%), etc as per details given in the table below and the guideline document annexure.

In addition to above the meter shall also record the Name plate details, programmable parameters (readable as profile), occurrence and restoration of tamper events along with the parameters Indian Companion Specification.

The BIS code for each parameter shall be as identified as per DLMS /COSEM protocol/ Indian companion standard.

20. DISPLAY OF MEASURED VALUE:

The measured value(s) shall be displayed on seven segments, seven digit (with ± indication), parameter identifier, backlit Liquid Crystal Display (LCD) display unit/register, having minimum character height of 10 mm, wide viewing angle. LCD shall be suitable for temperature withstand of 70 degree centigrade.

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

The meter should have facility of auto display mode where all parameters automatically scroll within the specified time and a manual mode where the parameters can be read by push button operation. In auto display mode each parameter shall on display for 10 seconds. The display “off” period between two cycles shall not exceed 30 seconds. The register should not roll over in between this duration.

It should be possible to easily identify the single or multiple displayed parameters through symbols/legend on the meter display itself or through display annunciators.

Meter shall have Scroll Lock facility to display any one desired parameter continuously from display parameters.

The register shall be able to record and display starting from zero, for a minimum of 1500 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.

The principle unit for the measured values shall be Wh/kWh/MWh for active energy, VA_rh/kVA_rh/MVA_rh for reactive energy & VAh/kVAh/MVAh for apparent energy. Bidder shall mention the scale in which the meter displays the energy values.

There should also be a provision through the push button mode to access a high resolution display of the principle unit of measurement for testing purpose. This high resolution display should provide for displaying the measured units up to 4 decimal point without any rounding off the digits in case of power failure.

21. DISPLAY PARAMETERS & DISPLAY SEQUENCE:

a) Consumer Meters

The meter shall display the following required parameters in two different modes as follows:

A) Auto-Display Parameters for CT operated Static Meters:-

1. LED/LCD test
2. Date
3. Real Time
4. Cumulative Reset Count
5. Phase to Neutral Voltages (R,Y,B) :
6. Line Currents(R,Y,B). :
7. Bill point Active Energy (Kwh) : History 1
8. Bill Point Average Power Factor : History 1
9. Bill Point Power-on-hours : History 1
10. Bill Point Tamper Count : History 1
11. Bill Point TOD Active Energy (Kwh) : History 1
12. Bill Point TOD Maximum Demand (KVA) : History 1
13. Instantaneous Average Power Factor
14. Cumulative Current Active Energy (Kwh)
15. Instantaneous Load (KW)
16. Indication of any present occurrence of tamper (i.e. existing tamper)

B) Push Button-Display (with back scroll facility) Parameters for CT operated Static Meters:-

1. LED/LCD test
2. Date
3. Real Time
4. Rising Demand (KVA) with elapsed time
5. Phase to Neutral Voltages (R,Y,B)
6. Line Currents (R,Y,B) :
7. Supply Frequency
8. Instantaneous Power Factor
9. Instantaneous Load, Active, Reactive, Apparent
10. Cumulative Reset Count
11. Bill Point Active Energy (Kwh) : History 1
12. Bill Point Apparent Energy (Kvah): History 1

13. Bill Point Average Power Factor : History 1
 14. Bill Point Power-on-hours : History 1
 15. Bill Point Tamper Count : History 1
 16. Bill Point TOD Active Energy (Kwh) : History 1
 17. Bill Point TOD Apparent Energy (Kvah) : History 1
 18. Bill Point TOD Maximum Demand (KVA) : History 1
 19. Cumulative Power-on-hours
 20. Cumulative Maximum Demand (KVA 0-24 HRS)
 21. Cumulative Current Active Energy (Kwh)
 22. Cumulative Current Reactive Lag Energy (Kvarh-Lag)
 23. Cumulative Current Reactive Lead Energy (Kvarh-Lead)
 24. Cumulative Current Apparent Energy (Kvah)
 25. Cumulative Current TOD Active Energy (Kwh)
 26. Cumulative Current TOD Apparent Energy (Kvah)
 27. Current TOD Maximum Demand (KVA)
 28. Indication of any existing Tamper
 29. Cumulative tamper occurrence counts
 30. Tamper information as mentioned in the relevant clauses of the specification should be recorded and displayed in the push button display
 31. Connection Check.
- C) One high resolution display for Kwh&Kvarh suitable for easy dial testing of the meter.

Data Transfer through HHU/CMRI/AMR/LAPTOP: Apart from the display parameters (Auto display & Push Button) as specified above and the standard parameters as specified in the relevant clause of the guideline document, the meter should record in addition the following parameters and all these parameters as well as the displayed parameters should be retrievable/Calculable at the BCS end through CMRI/HHU:

1. Bill Point TOD Reactive Energies (Kvarh) Lag & Lead
2. Current TOD Reactive Energies (Kvarh) Lag & Lead
3. Current Maximum Demand (KVA) (0 –24 HRS)
4. Instantaneous power factors of individual phases
5. Bill Point Power factors of individual phases
6. Detail Tamper information
7. Detail historical data of all the parameters for at least 6 calendar months
8. Information regarding following failures:
 - a) Time & Calendar
 - b) RTC battery
 - c) Segment failure.
 - d) Self diagnostic details
 - e) Battery bad flag

b) Ring Fencing/Boundary/Interface Meters

NA

c) DTR meters for HT consumers

The standard parameters as specified in the relevant clause of the guideline document shall be displayed in the auto display mode. Additional parameters if required for the push button mode and BCS mode will be notified in due course prior to ordering. However in addition to the daily accounting data, monthly or other periodic figures should also be available.

22. CALIBRATION & TEST OUTPUT:

All the meters shall be tested, calibrated and sealed at works before dispatch. Further, no modification of calibration shall be possible at site by any means.

However, it shall be possible to check the accuracy of energy measurement of the meter while in operation in the field by means of LED test output on meter, accessible from the front as well as through high-resolution display using suitable test equipment. Resolution of the test output shall be sufficient to enable the starting current test in less than 10 minutes.

Test output device shall be provided in the form of preferably one common LED for KWh, KVARh and KVAh with provision of selecting the parameter being tested. The test output device should have constant pulse rate in terms of pulse/unit energy.

23. REAL TIME INTERNAL CLOCK (RTC):

RTC shall be pre-programmed for 30 Years day/date without any necessity for correction. The maximum drift shall not exceed +/- 180 Seconds per year. The uncertainty of setting initial time shall not exceed ± 30 Seconds with respect to Indian standard time.

The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following:

- a) Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter;
- b) From remote server through suitable communication network or Sub-station data logger 'PC'

24. DEMAND INTEGRATION & MD REGISTRATION:

The meter shall continuously monitor and calculate maximum demand for each interval of time, which may be programmable as a block of 15 minutes or 30 minutes as per the user's choice through the communicating ports as and when required with proper password identification & authentication. At the end of every demand integration period the new calculated MD shall be compared with the previous MD and meter shall store whichever value is higher with date & time stamping. Under the current integration period, the rising demand should be displayed continuously along with the elapsed time. The rising demand with the elapsed time should be held in the memory in the event of interruption or switching off supply and it should not become zero on such instances. The registered demand and the number of times the MD is reset shall also be displayed and the information stored.

The display of Maximum demand should be as per the provision G-6 of IS 14697 : 1999

25. MD RESET:

It should also be possible to reset the MD using options. The meter shall have any of the following MD resetting options:

- (a) Automatic reset at the end of a certain predefined period by default (24:00 hrs of the last day of the month).
- (b) Resetting through a hand held terminal capable of communicating with the meter (i.e. through HHU with proper password identification & authentication).
- (c) Communication driven reset form the base terminal/server with proper password identification and authentication.

Note:- It should not be possible to reset the MD by the use of the local push button.

26. ELECTROMAGNETIC COMPATIBILITY:

The static energy meters shall conform to requirements listed in relevant standards and shall also be protected against radiated interference from either magnetic or radio-frequency source.

a. IMMUNITY TO ELECTROMAGNETIC DISTURBANCE

The meter shall be designed in such a way that conducted or radiated electromagnetic disturbance as well as electrostatic discharge do not damage or substantially influence the meter and meter shall work satisfactorily under these conditions as per relevant standards

NOTE: the disturbances to be considered are: -

- (a) Harmonics
- (b) Voltage dips and short interruptions
- (c) Conducted transients
- (d) D.C. and A.C. magnetic fields
- (e) Electromagnetic HF fields
- (f) Electrostatic discharges (ESD)

b. RADIO INTERFERENCE SUPPRESSIONS

The meter shall not generate noise, which could interfere with other equipment, and meter shall work satisfactorily as per relevant standards

27. TAMPER & FRAUD MONITORING FEATURES:

The meter shall work satisfactorily under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Vibrations, harmonic Distortion, Voltage/Frequency Fluctuations, and electromagnetic High Frequency Fields etc. The meter shall be immune to abnormal voltage/frequency generating devices and shall record the occurrence and restoration of such tamper events along with parameters such as current, voltages, kWh, power factor, event code, date & time etc.

Tamper details shall be stored in internal memory for retrieval by authorized personnel through either of the following:

- i) HHU.
- ii) Remote access through suitable communication network.

Minimum 250 numbers of events (occurrences & restoration with date & time) should be available in the meter memory.

The meter shall function properly under following common abnormal conditions:

1. Phase sequence reversal	The meter shall keep working accurately irrespective of the phase sequence of the supply.
2. Missing Neutral	The meter shall continue to record accurately according to electrical connections even if the Neutral of potential supply is accidentally or incidentally disconnected.
3. Current reversal / CT polarity reversal	The meter shall log energy in forward direction even if the current is flowing in reverse direction in one or more phases. The meter shall also be capable of detecting and recording occurrence and restoration with date and time if the current is flowing in reverse direction in one or more phases.
4. External magnetic influence	The metering system shall be provided with adequate magnetic shielding so that any external magnetic field (AC Electro Magnet or DC Magnet) as per the values specified in CBIP Technical Report No.88 (with latest amendments) applied on the metering system shall not affect the proper functioning and recording of energy as per error limits prescribed by CBIP.

Beside this the meter should have features to detect the occurrence and restoration of, at least, the following common abnormal events:

- a) **Missing Potential & Potential imbalance:** The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of Potential failure which could happen due to disconnection of potential leads (one or two), failure of phase line fuse from the Transformer primary side. Meter shall also detect and log cases of voltage unbalance (from 5 % for more than 5 minutes or more- programmable) of voltages.
- b) **Voltage High / Voltage Low:** In case the average 3 phase voltage remains less (below 0.75Vref by default) or more (above 1.15Vref by default) for a predefined period (15 minutes by default), the meter shall log such incidences with date & time. The voltage thresholds & persistence time shall be programmable using the CMRI & BCS. This abnormal condition shall be logged only when all the three-phase voltage is available.
- c) **Current imbalance:** The meter shall be capable of detecting and recording occurrence and restoration with date and time of Current unbalance (30% or more for more than 15 minutes- programmable).
- d) **Current Circuit Short:** The meter shall be capable of detecting and recording occurrences and restoration of shorting of any one or two phases of current circuit to identify events like CT saturation, CT lead shorting, CT inter turns short etc.
- e) **Current Circuit Open:** The meter shall be capable of detecting and recording occurrences and restoration of opening of any one or two phases of current circuit which can happen due to intentional / accidental disconnection of current circuits. The meter shall be able to log abnormality conditions in current open event

like CT leads burns, loose connection, CT winding open etc in the meter memory. No load condition should not be recorded in meter memory as a Current circuit open event.

- f) **Power on/off:** The meter shall be capable to record power on /off events in the meter memory. All potential failure should be record as power off event.
- g) **High Neutral Current:** The meter shall be capable of recording incidences of excess neutral current (if I_n is in excess of x % of I_b – programmable) .The limits shall be define by the purchaser during the time of final supply.
- h) **Over load/ low load Hours:** The meter shall be capable of recording the over load / low load hours in KVA in the meter memory. The over loads limit shall be in terms of % of Transformer rating in KVA (programmable using HHU & BCS). The over load limits shall be define by the purchaser during the time of final supply.
- i) The meter shall also be capable to withstand and shall not get damaged if phase-to-phase voltage is applied between phases to neutral.

The meter shall record the total duration of the above abnormalities, time and date of their occurrences & restorations with a snap shot of electrical conditions viz. Voltage, current, kwh energy, PF etc.

Logic for calculation of voltage and current imbalance shall be furnished by the tenderer.

The meter shall keep records for the minimum last 250 events (occurrence + restoration) for above of abnormal conditions. It shall be possible to retrieve the abnormal event data along with all related snap- shots' data through the meter's optical port or through radio with the help of a hand held unit (HHU) and download the same to the BCS where it shall be available for viewing. All this information shall be made available in simple and easily understandable format.

The above shall be selectable and will be in line with the GUIDELINE DOCUMENT: Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification

28. TAMPER LOGIC:

Properly designed meter event logic should be provided. There shall be separate compartments for logging of potential related event, current related event and power on/off event. The bidder should explain the events details in each compartment under their offer.

The logging of various events in each compartment should be as under:

Once one or more compartments have become full, the last event pertaining to the same compartment will be entered and the earliest (first one)-event should disappear. Thus, in this manner each succeeding event will replace the earliest recorded event, compartment wise. Events of one compartment/category should overwrite the events of their own compartment/category only.

Properly defined meter tamper logic should be provided. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to source side abnormalities.

There shall be separate compartments for logging of different types of tampers/events as follows:

Compartment No. 1:

40 % of the tamper memory space shall be allocated for the following current related tampers

- CT polarity reversal
- CT open circuit
- CT short (bypass)
- Current unbalance

Compartment No. 2:

35 % of the tamper memory space shall be allocated for potential related tampers including power failure events.

Compartment No. 3-7:

25 % of the tamper memory space shall be allocated for other events.

BILLING HISTORY & LOAD SURVEY

The meter shall have sufficient non-volatile memory for recording history of energy parameters for minimum last Twelve billing cycles (Bill date shall be 00 hrs of the 1st date of the calendar month by default – programmable) and information should be made available at the BCS end.

Load survey parameters, number of days and data set required for different categories will be made known in due course after consultation with the bidders before ordering.

These load survey and history data can be retrieved with the help of Meter Reading Instrument on local interrogation or remotely using the remote communication interface.

The above load survey data should be available in the form of bar charts as well as in spreadsheets. The BCS shall have the facility to give complete load survey data both in numeric and graphic form.

29. TOD METERING PROVISIONS:

There shall be a provision up to three Time of Day Zones for Energy (active import, reactive lag while active import & apparent import) and Demand (Apparent demand) registers. TOD provision shall however be as per the guideline document with maximum script identifiers (16) for energy and demand for future use. However at present only three time zones will be used : 06:00 Hrs to 17:00 Hrs, 17:00 Hrs to 22:00 Hrs and 22:00 Hrs to 06:00 Hrs. Number and timing of these TOD Zones shall be user programmable with proper security system.

30. HARMONICS MEASUREMENT:

THD up to 29th Harmonic shall be measurable that is at sampling rate of 3000/sec. The meter should be capable of measuring fundamental energy as well as total energy. Fundamental energy shall be made available on meter-display and the same only shall be used for billing purpose.

The total energy shall be logged in the meter memory and be capable of down loading to the BCS through HHU as well as through the remote communication port and be available for analysis at the BCS end.

31. SELF DIAGNOSTIC FEATURE:

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 at all time. The meter shall have indication for unsatisfactory/non-functioning/malfunctioning of the following:

- a) Time and date on meter display
- b) All display segments on meter display
- c) Real Time Clock (RTC) status in meter reading prints out at BCS end
- d) Non-volatile Memory (NVM) status in meter reading prints out at BCS end.
- e) While installing the meter, it should be possible to check the correctness of Current Transformer, Voltage connections to the meter and their polarity from the functioning of the meter for different voltage injections with the help of vector/phasor diagrams. It should also be possible to check the current and voltage sequence parity. For this purpose suitable software for field diagnosis of meter connections with the help of HHU/Meter Reading Instrument should be supplied.

32. OTHER SALIENT FEATURES OF METERS:

- a) It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.
- b) The meter must be readable in power off condition. For that a battery back-up of suitable capacity shall be provided. Push button for the normal display shall also be used for battery back-up display in power off condition for the manual mode reading of the auto display parameters. It must be possible to power up the battery by means of an external source or by the HHU itself for reading the meter in power off condition by the HHU. In case of an external source an inductive coupling arrangement shall be provided so that it should not be possible to damage the circuit of the meter by applying excess voltage directly in the meter. It must also be possible to trigger the battery to power up the meter in case of power failure from the remote server for reading the meter from remote location through the communication ports.
- c) The meter should work accurately irrespective of phase sequence of the mains supply
- d) The meter should remain powered up and functional even when either of the two phases or one phase along with neutral is available to meter.
- e) The meter should continue to record accurately as per prevailing electrical conditions even if the neutral of the potential supply gets disconnected.

33. TEST AND TEST CONDITIONS:

Unless specifically waived off, all tests shall be witnessed by the purchaser.

34.1 Type Test

The Energy meter offered shall be fully type tested at any of the NABL accredited test laboratories as per standards indicated in Clause 5 above. That is the meter offered should have successfully passed all type tests described in the IS 14697 and the meter Data Transfer and Communication capability as per the guideline document.

One (1) out of every one thousand (1000) meters or part thereof shall be subjected to the complete range of type tests after final assembly. In case of any failure to pass all specified tests, the bidder shall arrange to carry out the requisite modifications/replacements in the entire lot of meters at his own cost. After any such modifications and final assembly, two (2) meters selected out of the lot by the Owner's representative shall be subjected to the full range of type tests. The Owner shall accept the lot only after successful type testing.

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested at third party lab i.e. CPRI / agencies listed at Appendix-C of CBIP publication No-304 / NPL / CQAL/ ERTL / ERDA at the sole discretion of the Purchaser. The supplier has no right to contest the test results of the third party lab or for additional test and has to replace/take corrective action at the cost of the supplier.

It shall be the responsibility of the supplier to arrange such tests and Purchaser shall be informed of the date and time of conduction of tests well in advance to enable him to witness such tests. Test charges of the testing authority, for such successful repeat type tests, shall be reimbursed at actual by the Purchaser.

The meters used for type testing shall be separately identified, duly marked, and supplied to the Owner in case they are fully functional and as good as other (new) meters, after necessary touching up/refurbishing. In case this is not possible, the bidder shall provide their replacements at no extra cost to Owner.

The Bidder shall arrange all type testing specified above, and bear all expenses for the same.

Type test certificate shall be submitted along with the offer and the same shall not be more than 36 months old at the time of bid submission. Make & type of major components used in the type-tested meter shall be indicated in the QAP.

34.2 Acceptance Test

All acceptance tests as per relevant standards shall be carried out in the presence of utility representatives.

Additional acceptance shall include Surge withstand (SWC) for 6 kV_p, as per IEC 62052-11, Lightning impulse test and HF disturbance test as IS 14697. One sample meter per order from one of the offered lot shall be subjected to SWC/other semi-destructive tests. Meters after tests shall not be used.

Accuracy tests shall be performed at the beginning and at the end of the acceptance tests specified.

34.3 Routine Test

All routine tests as specified in table 18 of CBIP Technical Report No. 88 shall be carried out on each individual meter and routine tests certificates shall be submitted for approval of purchaser.

34. QUALITY ASSURANCE:

The manufacturer shall have a comprehensive quality assurance program at all stages of manufacture for ensuring products giving reliable, trouble free performance. Details of the bidder's quality assurance and test set up shall be

furnished with the bid. A detailed quality assurance program shall be finalized with the successful bidder during the award stage. Bidder shall furnish following information along with his bid:

- i) Organization structure of the manufacturer and his main sub-suppliers (PCBs, SMT cards, CT/PT) with details of 'QA' setup, overall workflow;
- ii) Copy of system manual showing 'QAP' (Quality Assurance Plan) as actually practiced during manufacturing and final testing.
- iii) List of raw materials and critical components (ASIC chip, crystal clock, memory register Chip, transformers, optical ports etc.) with their suppliers;
- iv) Stage inspection of product before final testing;
- v) Procedure adopted for 'In-situ' testing of PCBs, after placement of surface mounted component, for quantitative parametric variation of tolerance by self or sub-contractor.
- vi) Testing and calibration facility, date of calibration of test bench, manpower data of bench operators;
- vii) Sample copies of test certificate of bought out components.

35. FIXING & CONNECTION ARRANGEMENT:

Manufacturer shall ensure following technical points:

- i) Meter shall be suitable for mounting on Simplex type vertical panel with front door; CAT-M4 disconnecting type TBs to be used for Current circuit; Panel wiring to be properly dressed and harnessed; External cables to enter panel from bottom gland plate using double compression glands.
- ii) Energy Meter terminals block shall be adequately sized with regard to maximum conductor dimension, commensurate with current rating of Energy Meter.

36. SOFTWARE:

- a) Licensed copies of the relevant software shall be made available for installation on each Hand Held Unit (HHU) /Common Meter Reading Instrument (CMRI) and Base computer software (BCS) for installation on the server and other terminals by the supplier.

HHU/Common Meter Reading Instrument (CMRI) would be loaded with user-friendly software (windows based) for reading, downloading meter data and relevant programming transaction in the meter with proper security system.

- b) Windows based *user interactive* Base Computer Software (BCS) shall have to be supplied for efficient and speedy recovery of data from HHU/CMRI/Meter(by remote communication) and downloading instructions from base computer software to HHU/CMRI/Meter(by remote communication). **This BCS should have, amongst other requirements, features and facilities to communicate, download and display meter data as described in the "Guideline document – Data Exchange for Electricity Meter Reading, Tariff and Load Control (Companion Specification for IEC 62056 series of Standards)" from DLMS/COSEM meters.** The BCS should also have facility to convert meter reading data into user definable *DBF (Access) and spreadsheet* format for integrating with the purchaser's billing system. Here again an "Export wizard" or similar utility shall be available whereby user can select file format, the variable data to export, the field width selection of each variable so that it may be possible for the user to integrate the same with the user's billing data and process the

selected data in desired manner. The BCS shall also allow for viewing and easy analysis of the meter data acquired and for exporting that data in ASCII or CSV format. It should have in general the following features:

- i) It shall allow collecting of meter data on direct communication with the meter through wires as well as through remote system.
- ii) It shall be possible to view the meter data and details in user friendly manner (Windows Based Platform).
- iii) New users with their level of access rights could be defined and managed by supervisors based upon their usage requirement.
- iv) It shall be possible to maintain a meter information database, to add, edit, delete meters from the meter information database with proper authentication. The meter information database shall have amongst others the information relating to meter serial no, meter location, meter status, CT, PT ratios, KVA ratings etc.
- v) BCS must have provision to manage users and roles. It shall be possible to create a user and assign him privileges to perform specific types of operation according to the "Role" assigned to him. It shall be possible to define a role and link it with "Rights" of using different options. If rights are not assigned for a particular option, a "User" with that "Role" shall have no right to use or view that option.
- vi) The software must have the user friendly GUI and User Interface should be customizable by the user. It shall be possible for a user to
 - a) Display or hide a column in the Meter List Pane
 - b) Change the column width
 - c) Activate & apply column wise filter for displayed list
 - d) Sort the order of the displayed list. The sorting can be enabled on any of the displayed field / column
 - e) Group the meter list according to a field displayed in a column and then further sub-group the list according to another field

The software's shall have the flexibility to generate at least the following sets of reports amongst others

- Energy Accounting reports
- Billing Point reports
- Load survey reports
- Tamper information reports

Billing reports to include customer ID, Name & Address, connected Load, meter status, billing cycle, historical meter reading, date and time, current meter reading, date and time, Maximum Demand, date and time of Maximum Demand occurrence.

Load survey report for a pre determined time i.e. from _____ date to _____ date, to include the following.

Customer ID, meter number, Consumer *Connectivity references i.e. identity* & location of pole / Distribution transformer reference, feeder reference, sub-division reference, division reference, circle reference, time, date,

maximum demand (kW),KVAR, kWh, power factor, kVAh, MD reset count, power on hours, outage duration, number of outages, Voltages max R, Y, B date time and duration, Voltages minimum R, Y, B date time and duration, load factor as (energy consumed/(maximum demand x power on hours)), average load as (energy consumed / power on hours), TOD max DEMAND and duration, Average current phase wise.

The load survey data should be available in the form of bar charts as well as in spreadsheets. The BCS shall have the facility to give complete load survey data both in numeric and graphic form. The exact parameters set and the period for the load survey report for each category of meters will be specified in due course after consultation with the bidders prior to ordering

Tamper reports to include for a pre determined duration or month wise, tamper count, tamper duration and tamper history for each of the meters.

Vendor will provide soft copy of all the software in CD form along with the meters supplied.

Vendor to install & demonstrate working of software programmes on the HHU/CMRI's

Base computer station software for accepting data from hand held unit/CMRI/ for Processing, generating reports and downloading instructions from the BCS to HHU/CMRI for onward transmission to DLMS/COSEM meters of specific makes, This may include meters of other leading makes.

- c) Dial-up software for accepting data from the meter by remote communication means to the BCS, processing data, & generating reports.

37. SOFTWARE SECURITY:

The BCS shall have multilevel password for data protection and security. The first level shall allow the user to enter the system. The different software features shall be protected by different passwords. The configurable of passwords shall be user definable. The software installed on one PC shall not be copied on another PC without additional security.

38. HELP SYSTEM:

Exhaustive online & offline help shall be an integral part of the software so that user can use all the features of the software by pulling down the help contents from the user friendly menus for any references.

39. DATA SECURITY:

In addition to the basic security, selective advanced security with encryption and authentication by the use of NIST SP 800-38D as specified in the companion standard guideline document must be provided for.

The security system must be adequate enough not to allow data manipulation at any stage.

The system should be able to achieve security through authenticated transaction on the HHU/CMRI form the back office software only.

**TECHNICAL SPECIFICATION FOR PILFER PROOF METER BOX
TO HOUSE THE AMR METER & MODEM FOR HT CONSUMER**

1.0 TECHNICAL DETAILS:

Meter box shall be weather proof made of fire retardant Engineering plastic material.

Meter box shall be capable of withstanding temperatures of boiling water for 5 minutes continuously without distortion or softening. It shall withstanding Glow wire test at 650°C as per IS:11000. The thickness of box shall not be less than 3 mm from load bearing side (i.e. back side of the box) and other sides, and roof shall not be less than 2.0 mm. The meter box shall have its roof tapering down to both sides for easy flow of rainwater.

Meter box shall be suitable to mount energy meter & Modem. Box shall have one hole of suitable dia with engineering plastic cable gland for secondary cables of CT/PT connections.

The box shall generally comply with provision of IS 14772. Meter box shall be suitable for indoor / outdoor installation. The metering Box shall have good workmanship.

The inner dimension of the Meter chamber shall be such that there shall be a minimum 50 mm clearance on both side of Meter, minimum 25 mm from top & front side and 10 mm on the back side of the meter.

Soft rubber gasket shall be provided all around, wherever required for protecting against entry of dust and water. It shall comply with IP-5.

a) **Colour:** Dark admiralty gray.

b) **The contents of the box are as follows:**

i.) **Viewing Window:**

Viewing window on meter compartment shall be made of scratch and break resistant transparent clear high grade engineering plastic/Polycarbonate material, it shall be provided on the door of meter compartment for reading meter. The minimum thickness of the window shall be 2 ± 0.2 mm.

There shall not be any ingress of moisture through this window into the box.

ii) **Hinges:** A minimum of 2 nos. hinges of each compartment well protected against corrosion shall be provided. Provision for door opening in such a manner that the door opens by a minimum of 120 degrees.

iii) **Handle:** Suitable handle or knob shall be provided for opening the box door(s).

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

v) **Latch:** Each door shall be provided with 2 nos. zinc plated latches.

vi) **Sealing arrangement:** Box shall have provision of minimum 2 Nos. sealing arrangement to make the meter box fully tamper evident.

vii) **Printing:** Purchase order No. & Date shall be marked on Metallic plate on the top cover of the meter Box. The name of the manufacture shall be embossed/ marked on the bottom half of the Box.

viii) The fixing arrangement shall not be complex and it shall be easily approachable for connections when the door is open and completely tamper evident once it is sealed.

ix) Modem Mounting provision is required.

x) The dimensional drawing of metering Box shall be enclosed with bid.

2.0 ACCEPTANCE TEST

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter, and ensuring ease of connecting and reading the meter.

3.0 ROUTINE TEST

The routine test certificates for the following will be furnished along with material.

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter, and ensuring ease of connecting and reading the meter.

**TECHNICAL SPECIFICATION FOR AC 3 PHASE 4 WIRE LT CT OPERATED
STATIC TRIVECTOR METER, CLASS 0.5s ACCURACY (AMR COMPITABILITY)**

1.0 SCOPE:

The specification includes the design, engineering, manufacture, assembly, inspection, testing at our works before dispatch, packing, supply and delivery at site, insurance of DLMS compliant AMR compatible with GPRS Modem compatibility features LTCT operated 240 V 3Phase 4 Wire static Energy Meter of class 0.5 accuracy, housed in tamper proof box capable of accommodating GPRS Modem (Supply of Modem is not in our scope of supply against this Tender) along with CT's of accuracy class 0.5 housed in CT box and hardware and software as per requirement given in your specification.

The installation of meter is not cover under our scope against this tender.

The scope also covers providing seals as per required specification of the Meters.

The meter should be 3 phase 4 wire type with 4 CT's suitable for energy measurement of solidly earthed balanced/unbalanced 3 phase system with a power factor range of zero lagging through unity to zero leading.

The meter will consist of measuring element, registers, operational indicators and test outputs enclosed together in the meter case.

2.0 STANDARDS APPLICABLE:

The performance & testing of the meters shall conform to the following Indian/International standards with updated and latest amendments/revisions thereof:

The energy meter shall have accuracy of 0.5 for active/reactive/ apparent energy and conform to relevant clauses of following standards or reports:

Sr. No	Standard No.	Title
1.	IEC 62053-22	AC Static Watt-hour meters for active energy class 0.5S
2.	IS 14697-1999	AC Static Watt-hour meters for active energy class 0.2 & 0.5
3.	CBIP-88 Technical Report No. 88	Specification for AC Static Electrical Energy Meters
4.	CBIP Technical Report No. 111	Specification for Common Meter Reading Instrument
5.	IS: 9000	Basic Environmental testing Procedures for Electronics & Electrical items
6.	Standard Technical Specification	Standard technical specification, Indian Companion Specification.
7.	IS-15707	Specification for testing, evaluation etc.

PRIORITY: Technical specifications would basically conform to latest guideline documents/ Indian Companion Standards ICS – BIS-ETD 13 – 6211 – April 2010 as far as practicable.

3.0 CLIMATIC CONDITION:

The meters shall be suitable for satisfactory continuous operation under the following tropical conditions. Meters will be capable of maintaining required accuracy under hot, tropical and dusty climate conditions.

i)	Maximum Ambient Air temperature in shade	:	55°C
ii)	Minimum Ambient Air Temperature	:	-10°C
iii)	Maximum Relative Humidity (condensing)	:	95%
iv)	Minimum Relative Humidity	:	10%
v)	Height above mean seal level*	:	Up to 2200 meters
vi)	Avg. No. of tropical monsoon (conditions/ annum)	:	5 months
vii)	Annual Rainfall	:	100 to 1500 mm
viii)	Wind Pressure	:	200 kg/sq m
ix)	Noise level	:	45 DB

The meters shall be capable to withstand moderately hot and humid climate, conducive to rust and fungus growth. We have noted that the climate conditions prone to wide variations in the ambient conditions, smoke present in atmosphere & lighting during rainy season.

The meter shall be suitable for installation up to an altitude of 2200 meter above mean sea level. For meters to be used for an altitude of above 2200 MSL necessary corrections shall be carried out in BIL and one minute power frequency with stand voltage capability as per relevant standard.

4.0 SUPPLY SYSTEM:

Type of installation	:	Indoor
System	:	3-phase 4-wire
System Voltage (Vref)	:	3x400 volt ph-ph
	:	3x240 volt ph-n
System frequency	:	50 Hz
No. of Phases	:	3

The meters shall be suitable for use on LT 3x240V, 3 ph, 4-wire system with 4 Nos. of CT's of secondary current 5A. The meter will be suitable for balance as well as unbalance loads at all power factors. The rated basic current for the offered meter shall be 5 Amps.

5.0 POWER FACTOR RANGE:

The meter shall be suitable for full power factor range from Zero (lag) to Unity to Zero (lead).

6.0 POWER SUPPLY VARIATION:

The extreme power supply variation which an operating meter would withstand without damage and without degradation of its meteorological characteristics when it is subsequently operated under its operating conditions:

Voltage	:	70% to 120% of Vref.
Frequency	:	± 5% of 50 Hz

7.0 ACCURACY:

The class of accuracy of the meter shall be 0.5. The class of accuracy of CT will be 0.5. The class of accuracy would not drift with time & shall meet the requirement of CBIP-88.

8.0 POWER CONSUMPTION:

- 8.1** The active and apparent power consumption on each voltage circuit including power supply of the meter at ref. Voltage, temperature and frequency shall not exceed 1.5 watts/phase and 8 VA/phase. (As per relevant clause of IS: 14697).
- 8.2** The apparent power drawn by each current circuit of the meter shall not exceed 1 VA/phase at basic current, reference frequency and reference temperature. (As per relevant clause of IS: 14697).

9.0 STARTING CURRENT:

The meter will start registering energy at 0.1% of basic current at unity power factor and shall be fully functional within five seconds after the rated voltage is applied.

When the voltage is applied with no current flowing in the current circuit, the meter shall not register any energy and the test output of the meter will not be more than 1 pulse per count on no load.

10.0 MAXIMUM CONTINUOUS CURRENT:

The maximum continuous current in offered meters shall be 200% of rated basic current (Ib) at which the meter purports to be meet the accuracy requirements as per the relevant standards.

11.0 GENERAL & CONSTRUCTIONAL REQUIREMENTS:

- 11.1** Meters must be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured:-
- a) Personal safety against electric shock
 - b) Personal safety against effects of excessive temperature
 - c) Protection against spread of fire
 - d) Protection against penetration of solid objects, dust & water
 - e) Protection against fraudulence
 - f) Protection against pilferage
 - g) Protection against fiddling with internal components
 - h) Size of the meter along with tamper proof meter box shall be as per the drawings enclosed with our offer for your ready reference.
 - i) The meter should not be affected by spurious signal injection. Under presence of magnet the meter will work detailed in Cl. No. 25.0 of our technical offer.
- 11.2** The meter should be designed with application specific integrated circuit and shall be manufactured using SMT (Surface Mounting Technology) components. Power supply and voltage divider circuits shall be of PTH technology. The meter would be housed in a safe, high grade engineering plastic tamper continuous seamless ultrasonically welded casing with base, which is of projection mounting type and is dust/moisture proof, conforming to IP-51 of BIS 12063/IEC529.
- 2 Nos. Holographic seals shall provided at front and side joints of meter. Polycarbonate seals shall be provided 2 nos. at Meter body, 2 nos. at terminal cover, 2 nos. at Meter box compartment, 1 no. at optical port (RS-232 port is under the sealable ETBC hence separate sealing arrangement not provided) and 1 no. at MD reset push button, 2 Nos. at CT compartment box.
- 11.3** All insulating material used in the construction of meters shall be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion shall be effectively protected against corrosion throughout during operating life by providing suitable protective coating.
- 11.4** The meter must be supplied with a non-detachable, transparent extended terminal block cover (ETBC). The meter case shall be made of unbreakable, high grade, fire resistant, non-flammable, engineering plastic. The ETBC shall be made of unbreakable, high grade, non-flammable, polycarbonate (not bakelite).
- The non detachable extended terminal block cover attached with the meter block would be separately sealable at two places and shall be at the bottom of the meter. The ETBC once sealed would prevent unauthorized tampering by physical means.
- The terminal block shall have sufficient insulating properties, mechanical strength and should house tin/nickel plated solid brass terminals with two fixing screws per terminal. The terminals should be designed to withstand high continuous overload of 200% of Ibasic.
- 11.5** The meter should not get damaged / influenced by the electromagnetic disturbances and electrostatic discharge, harmonics, voltage dips and short interruptions, transients, DC and AC magnetic field (as per IS 14697/ CBIP-88 with latest amendments), remote jamming through spurious signals injection etc. the offered meter shall work as per the limits specified in CBIP Technical Report No.88.
- The meter shall record as per the prevailing electrical conditions when neutral is disconnected & phase voltage is applied on the neutral. Also the offered meter shall record it as an invalid voltage tamper and register energy with reference voltage, actual current and UPF & the phasor diagram of the same can be viewed at CMRI/BCS end.
- 11.6** The meter shall have an operation indication device such as a blinking LCD/LED. The operation indicator shall be visible from the front window and capable of being monitored conveniently with suitable testing equipment.

- 11.7** The meter shall conform to the degree of protection IP 51 as per IS: 12063/IEC: 529 for protection against ingress of dust, moisture, vermin's etc.
- 11.8** The meter cover, base & ETBC shall be made up of unbreakable, high grade, non-flammable high grade engineering plastic. The meter terminal block shall be made of unbreakable, high grade, non-flammable high grade engineering plastic. Also the tamper proof meter box shall be made up of unbreakable, fire resistant, non-flammable polycarbonate / engineering plastic material as per our offer. The Offered Meter cover & ETBC shall be transparent.
- 11.9** The meter case shall have scratch less, transparent, high grade engineering plastic window for easy reading of all the displayed values/parameters, name plate details and observation of operation indicator. The transparency of the window shall remain un-influenced with the environmental conditions. The meter cover shall be seamless welded with meter base such that it cannot be removed undamaged without breaking the meter case.
- 11.10** The meter, ETBC and the tamper proof meter box shall ensure safety against the spread of fire. They would not be ignited by thermic overload of live parts in contact with them.
- 11.11** The meter shall have tin/nickel plated brass terminals. The terminals shall have suitable construction with barriers and cover to provide firm and safe connection of current and voltage leads of stranded copper conductors.
- 11.12** The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. The internal diameter of the terminal holes shall be 5.5mm minimum. The clearance and creepage distance shall conform to relevant clause of IS 14697/CBIP technical report No. 88.
- 11.13** The meter shall be compact in design. The entire construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.
- 11.14** The meter shall have a design life of 10 years and confirmed for 5 years Guarantee from the date of supply on the meter against any kind of failure/defects/mal-operation.
- 11.15** The meter shall be provided with an inbuilt accurate quartz crystal based real time clock and calendar, the maximum permissible drift in the real time clock up to 3 minute per year. The clock reading shall be adjustable through CMRI/BCS with proper password protected security. The meter time synchronization through CMRI / BCS should be provided with proper security system so that unauthorized time change is not accepted by the meter. Battery backup should be provided to maintain the time in absence of mains supply.
- The battery life would be at least 3 years when meter is not powered up and 10 years when meter is under powered up condition.
- 11.16** The integration period shall be set as 30 minutes and shall be programmable for setting any integration period 15/30/60 minutes desired by DEPARTMENT OF POWER subsequently, on real-time basis.
- 11.17** The software (meter reading software for CMRI/BCS, Base Computer software for meter data analysis and technical details) shall be provided under mutually agreed conditions.
- 11.18** It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.
- 11.19** The meter shall have provision to be read in the absence of power supply through LCD auto-display with internal battery. Annexure tamper is enclosed with the bid for your ready reference.
- 11.20** The meter should work accurately irrespective of phase sequence and shall indicate for wrong phase association.
- 11.21** The meter should remain powered up and functional within same accuracy class as per the prevailing electrical conditions, even when either any two phases or any one phase with neutral is available to the meter.
- 11.22** The meter would continue to record accurately as per prevailing electrical conditions even if the neutral of potential supply gets disconnected.

- 11.23** The meter shall suitably indicate as tamper on display and record in forward direction even if one or more CTs are reversed/shorted or missing of one or two potential. The offered meters shall record as per prevailing electrical condition under the event of missing potential and CT short/ bypass.
- 11.24 Data Security:** The meter shall have multilevel password for data protection and security. The meter data retrieval shall be possible directly to authenticated BCS/through authenticated CMRI prepared by base computer software. The meter shall support the event of change of TOD register timings/no. of TOD registers, demand integration period and/or setting the meter time etc. through authenticated transaction and shall be logged as an transaction. The transaction events shall be available for viewing at BCS end. Last 20 no. of events will be available at BCS end as FIFO basis.
- 11.25** The meter data shall be retrievable directly through BCS/through CMRI and downloadable by CMRI to base computer software for viewing. The meter data downloaded at BCS end should be in user-friendly formats. We will supply the required software for base computer system. The base computer software will have the facility to convert the required data (for billing, Energy Audit, tamper analysis purposes) in to ASCII format as per utility requirement for further analysis & billing purpose. The ASCII format data can be used as input data for any other software to generate desired reports as per the utility requirement.
- 11.26** The meter should not generate noise in case of interfere with other equipment.
- 11.27** Every meter should have three fixing holes, one at top and two at bottom. The top hole will be provided with a special clip at the back of the meter so that the holding screw is not accessible after the fixing of meters. The lower fixing screw shall be provided under the sealed terminal cover. The requisite screws shall be supplied with each meter.
- 11.28** The meter must work satisfactorily with guaranteed accuracy as per the limits specified in the relevant standard under presence of various influencing conditions like External Magnetic Field, Electromagnetic Field, Radio Frequency Interference, Vibrations, harmonic distortion, voltage/frequency fluctuations, electromagnetic high frequency fields etc. as per the limits specified in the relevant clauses of the applicable standards. The meter shall be capable of recording as per the prevailing electrical conditions in case of application by fraudulent means as specified Cl. No. 25.0 of your technical specification.

The meters must be design to sense the presence of magnet, and under presence of magnet the error limits specified shall be as in the CBIP report no. 88.

12.0 SEALING OF METER:

Reliable sealing arrangement should be provided to make the meter tamper evidence and avoid fiddling or tampering by unauthorized persons by way of providing two no. of sealing arrangement on meter terminal cover, one no. of sealing arrangement on optical communication port, two no. of sealing arrangement on the meter cover & one no. of sealing arrangement on the MD reset push button. All the seals shall be provided in front side only. Rear side sealing arrangement shall not be provided.

13.0 NAME PLATE MARKING OF THE METER:

The marking on every meter shall be in accordance with relevant clauses of IS 14697.

Every meter shall have name plate beneath the meter cover such that the name plate cannot be accessed without opening the meter cover and without breaking the seals of the meter cover and the name plate shall be marked distinctly and indelibly. The basic marking on the meter nameplate will be as follows:

- a) Manufacturer's name & trade mark
- b) Type Designation
- c) No. of phases & wires
- d) Serial Number
- e) Month and year of manufacture
- f) Reference Voltage
- g) Rated secondary Current of CT (/5A)
- h) Reference Standard: IS 14697
- i) Principal unit(s) of measurement
- j) Meter Constant (imp/kwh, kvArh, KVAh)
- k) Class index of meter

- l) “Property of “DEPARTMENT OF POWER, ARUNACHAL PRADESH”
- m) Contract Agreement No. and Date
- n) Guarantee period

14.0 CONNECTION DIAGRAM & TERMINAL MARKINGS:

The terminals shall be marked properly on terminal block for giving external connections. A diagram of connections should be provided inside the cover of terminal block. The terminal cover shall be extended such that when it is placed in position it is not possible to approach the connections or connecting wires. The terminals and the screws shall be suitable to carry upto 200% of Ibasic safely for two hours. The terminals shall have suitable construction with barriers and covers to provide secure and safe connections.

15.0 READ OUT FACILITY THROUGH CMRI, OTHER REMOTE COMMUNICATION MEANS:

A) The meter must be provided with a galvanically isolated optical communication IEC 1107 port which shall have sealing arrangement with removable cover so that it can be easily connected to a CMRI (Common Meter Reading Instrument)/BCS for data transfer or transfer of data through remote metering device such as modem etc. The optical communication port shall also have sealing provision.

B) The meter shall have the facility of readability and downloading through remote application.

In view of installation of the meter inside a tamper proof/evident box, suitable & convenient sealing arrangement of the meter box shall be provided by us. Also it shall have facility for downloading of meter data by CMRI/BCS through optical port. The offered meters shall be installed in the meter mounting box. Meters can be read with the help of CMRI without opening the meter box cover. The drawing of the meter box should be enclosed with the offer.

16.0 SOFTWARE:

Sufficient no. of mutually agreed licensed copies of the latest relevant software shall be made available and shall be installed by the Bidder on each common meter reading instrument (CMRI) and Base computer software.

Common Meter Reading Instrument (CMRI) & BCS must be loaded with user friendly software of latest higher version, compatible for reading, downloading meter data and time of day (TOD) programming etc in the meter.

Windows based user interactive Base Computer Software (BCS) for receiving data from BCS/CMRI and downloading instructions from base computer software to Meter, CMRI shall also be provided by us (Unit rate of same is quoted optionally in Price Schedule).

This BCS should have, amongst other requirements, features and facilities described later in the specification, the facility to convert meter reading data into ASCII format and spreadsheet format. Here again an “Export Wizard” shall be available whereby user can select file format, the variable data to export, the field width selection of each variable so that it may be possible for the user to integrate the same with the user’s billing data and process the selected data in desired manner.

Individual meter data file shall be made available in which billing data, load survey data and tamper data can be viewed and further analysis can be done.

The software shall also have the capability to collect the data through remote meter reading.

16.1 Meter data can be converted to ASCII format by the Base computer software which can be further used by DEPARTMENT OF POWER using any third party software to generate billing reports.

16.2 The Bidder should note the contents of the clause and the parameters selected for load survey in meter which shall be available at BCS end.

The Load survey data should be available in the form continuous, bar charts as well as in spread sheets. The BCS shall have the facility to give complete load survey data both in numeric and graphic form.

16.3 Meter data can be converted to ASCII format by the Base computer software which can be further used by DEPARTMENT OF POWER using any third party software to generate load survey reports.

However, tamper details shall be available at BCS end which can be analyzed by DEPARTMENT OF POWER.

16.4 Meter reading software as detailed above shall be provided to read offered meters.

16.5 The Bidder shall install & demonstrate compatibility of meter software with the DOS based CMR/ BCS programme supplied by them to read their make of meters.

17.0 CALIBRATION AND TEST OUTPUT:

The meter should have test output accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device shall be provided in the form of LED. For This Two LED shall be provided on meter, left LED for kWh and right LED for KVAh, KVArh (Lag) & KVArh (Lead) with provision of selecting the parameter being tested. The test output device should have constant pulse rate in terms of pulse/unit energy.

The meter shall be tested, calibrated and sealed at works before dispatch. Further, no modification of calibration shall be possible at site by any means.

The resolution of the test output shall be sufficient to enable the static current test in less than 10 minutes.

The relation between test output & the indication on display shall comply with the marking on the name plate (imp/kWh) / (imp/kVAh).

18.0 DISPLAY:

The meter shall be provided with inbuilt accurate quartz crystal based real time clock and calendar. The clock reading shall be adjustable through CMRI/BCS with proper password protected security. The meter time synchronization through CMRI/BCS should be provided with proper security system so that unauthorized time change is not accepted by the meter. Battery backup should be provided to maintain the time in absence of mains supply.

The battery life should be at least 3 years when meter is not powered up and 10 years when meter is under powered up condition.

The meter shall have a 7 digit, 7 segment display of liquid crystal display (LCD) with another digit for legend. The minimum character height shall be 10 mm. Provision will be made to read consumption in decimal multiples(i.e. based on commissioning) to display content of relevant parameters with another digit displaying legend for identification.

The meter shall have facility of auto display mode where all parameters automatically scroll within the specified time and a manual mode where the parameters can be read by push button operation. In auto display mode each parameter shall be on display for 10 seconds. The display "off" period between two cycles shall not exceed 120 seconds. The register should not roll over in between this duration.

The meter should have non-volatile memory, so that the registered parameters shall not be affected by loss of power. A provision shall be made to read the meter parameters such as MD and consumption, etc., through the meter cover window without actually opening the meter cover. The non-volatile memory should have a minimum retention time of 10 years under un-powered condition.

It should be possible easily to identify the display parameters through symbol/legend to be made available on the display itself.

The register shall be able to record and display starting from zero, for a minimum of 1600 hours, which shall be dependant on the commissioning value, the energy corresponding to the maximum current at reference voltage and unity power factor. The register should not roll over between this duration.

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

There shall be a tamper proof provision of meter reading through LCD display in case of “Power Off” condition or “long power cut scenario” with the help of Internal Battery.

18.1 A) DISPLAY SEQUENCE:

The meter shall display the required parameters in two different modes as follows, however, the Bidder shall note that DEPARTMENT OF POWER may ask for modification in the display sequence and display parameters at the time of placing P.O., if required:-

a) Auto Display Mode:

The following parameters hereinafter referred to as “Billing Parameters” (B.P.) shall be displayed in an auto-cycle mode, in the following sequence:

- i) Display test (LCD segment check)
- ii) Meter serial Number
- iii) Real time
- iv) Date
- v) Cumulative Active energy import (forwarded) reading (kWh) for the previous Calendar month for billing purpose (BP kWh) – (History 1)
- vi) Cumulative Apparent energy import (forwarded) reading (kVAh) for the previous Calendar month for billing purpose (BP kVAh).-(History 1)
- vii) Maximum demand (kW forwarded – 0-24 hours) (during the previous month) for billing purpose (BP kW) (History 1)
- viii) Maximum demand (kVA forwarded – 0-24 hours) (during the previous month) for billing purpose (BP kVA) (History 1)
- ix) Average power factor of the last consumption month for billing purpose (BP PF) (Billed average power factor History 1)
- x) Cumulative tamper occurrence count readings of the last two consumption months. (Billed tamper occurrence count of 1st and 2nd History month)
- xi) Cumulative “power on” hours reading of the last two consumptions months (BP POH) (Power on hours History 1 & 2)
- xii) Cumulative Active energy import (forwarded) energy register.
- xiii) Cumulative Apparent energy import (forwarded) register.
- xiv) Instantaneous Load (KW).
- xv) Instantaneous Load (KVA).
- xvi) MD Reset count
- xvii) Connection Check

Push Button Mode

- Supply frequency
- Instantaneous Phase to Neutral voltages-R
- Instantaneous Phase to Neutral voltages-Y
- Instantaneous Phase to Neutral voltages-B
- Instantaneous R Phase Line Current
- Instantaneous Y Phase Line Current
- Instantaneous B Phase Line Current
- Instantaneous Power Factor
- Time & Date of Previous Month Active MD (KW) occurrence- History 1
- Time & Date of Previous Month Apparent MD (KVA) occurrence- History 1
- Cumulative MD kW forwarded
- Cumulative MD kVA forwarded
- Rising demand with elapsed time
- Present CT Status
- Present PT status
- Present Other Status
- Last occurrence tamper ID
- Date of last tamper occurrence
- Time of last tamper occurrence
- Last restoration tamper ID

- Date of last tamper restoration
- Time of last tamper restoration
- Cumulative power on hours
- Cumulative tamper occurrence count
- Cumulative MD kVA forwarded
- TOD Register [Active forwarded energy (8 nos.)] – History 1
- TOD Register [Active forwarded energy (8 nos.)] – History 2
- TOD Register [Active forwarded energy (8 nos.)] – History 3
- TOD Register [Apparent forwarded energy (8 nos.)] – History 1
- TOD Register [Apparent forwarded energy (8 nos.)] – History 2
- TOD Register [Apparent forwarded energy (8 nos.)] – History 3
- Active forwarded MD 0-24 Hr – History 1
- TOD Register [Active forwarded MD (8 nos.)] - History 1
- Active forwarded MD 0-24 Hr – History 2
- TOD Register [Active forwarded MD (8 nos.)] - History 2
- Active forwarded MD 0-24 Hr – History 3
- TOD Register [Active forwarded MD (8 nos.)] - History 3
- Apparent forwarded MD 0-24 Hr – History 1
- TOD Register [Apparent forwarded MD (8 nos.)] History 1
- Apparent forwarded MD 0-24 Hr – History 2
- TOD Register [Apparent forwarded MD (8 nos.)] History 2
- Apparent forwarded MD 0-24 Hr – History 3
- TOD Register [Apparent forwarded MD (8 nos.)] History 3

Read Out Parameters with CMRI/BCS:

All above including following:

- Energy registers
- Billing registers
- TOD Registers
- Load survey data
- Tamper and fraud (all event details with date and time)
- Self diagnostics details
- Real time calendar clock status
- Battery bad flag
- History of monthly Energy Flow, Maximum Demand, Average power factor for the last 12 histories (current month & last 11 month histories).

19.0 MAXIMUM DEMAND REGISTRATION:

The maximum demand shall be monitored during each demand interval set with 30 minutes integration and the maximum of these in a month shall be stored. Whenever MD is reset, the maximum demand value so registered shall be stored along with date and time. Under the current integration period, the rising demand should be displayed continuously along with the elapsed time. The registered demand and the number of times the MD is reset shall also be displayed and the information will be stored.

20.0 MAXIMUM DEMAND RESET:

Facility for auto reset of MD at 00.00 hrs of first of every month shall be provided for which minimum 30 years calendar shall be programmed by us. The offered meter shall display the maximum demand reset count.

21.0 SELF DIAGNOSTIC FEATURE:

The meter shall be capable of performing complete self diagnostic check to monitor the circuits for any manufacturing to ensure integrity of data memory location at all time. The meter shall 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) failure indication at BCS.
- e) Low battery indication at BCS.

While installing the meter, it should be possible to check the correctness of phase sequence, Current Transformer, Voltage connections to the meter and their polarity from the functioning of the meter for different voltage injections with the help of vector/ phasor diagrams. For this purpose Install check software for field diagnosis of meter connections with the help of meter reading instrument should be supplied.

22.0 LOAD SURVEY CAPABILITY:

Load Survey Capability:

The meter should log following 8 (eight) parameters in 30 minute integration period for 45 days:

- a) kWh forwarded
- b) kVAh forwarded
- c) R-Phase Line Current
- d) R-Phase Line Current
- e) R-Phase Line Current
- f) Phase to neutral voltage (R)
- g) Phase to neutral voltage (Y)
- h) Phase to neutral voltage (B)

It should be possible to select either demand or energy view at the BCS end. The above load survey data should be available in the form of bar charts as well as in spreadsheets. The BCS shall have the facility give complete load survey data both in numeric and graphic form.

The load survey data, abnormality event information and instantaneous parameters data shall all be retrievable through the meter's communication port directly by BCS/through radio communication from a common meter reading instrument (CMRI) and shall be transferred (downloaded) to a PC with user friendly Windows based software to get complete details in numerical and/or graphic form. The necessary base computer software (BCS) for this purpose shall be provided by the Bidder with complete details.

The meter shall have sufficient non-volatile memory for recording history of energy parameters for last twelve billing cycles' i.e. current month & last 11 month histories (Bill date will be 00 hrs. of the 1st date of the calendar month by default – programmable) and information would be made available at the BCS end.

23.0 TIME-OF-DAY (TOD) TARIFF/DEMAND:

The meter shall have provision of registering the time-of-day energy and maximum demand. It shall be possible to define TOD register for active forwarded, apparent forwarded energy type.

The meter shall have in-built capacity to define up to eight (8) time zones through operation of CMRI. The change of the TOD time- period(s) or changing number of TOD zones should be possible through CMRI with special authenticated command from the BCS so that only authorized person (s) can make such changes. The main control of this system along with proper security password/ code should be available on one or more computers located at the authorized location(s) as per the directions given by the **DEPARTMENT OF POWER**.

24.0 HARMONICS MEASUREMENT

Up to 29th Harmonic shall be measurable that is a sampling rate of 3000/sec. The meter should be capable of measuring fundamental energy as well as total energy. Fundamental energy shall be made available on meter-display and the same only shall be used for billing purpose.

The total energy shall be logged in the meter memory and be capable of down loading to the BCS through CMRI/directly and be available for analysis at the BCS end.

25.0 TAMPER & FRAUD PROTECTION

The offered meter will function properly under following common abnormal conditions:

1. Phase sequence reversal	The meter shall keep working accurately irrespective of the phase sequence of the supply.
2. Missing Neutral	The meter shall continue to record accurately according to prevailing electrical connections even if the Neutral of potential supply is accidentally or incidentally disconnected however voltage and current should be balanced.
3. Current reversal/CT polarity reversal	The meter shall log energy in forward direction even if the current is flowing in reverse direction in one or more phases.
4. External magnetic influence (as per IS 14697/ CBIP-88 with latest amendment)	The meter should be provided with adequate magnetic shielding so that any external magnetic field (AC Electro magnet or DC magnet) as defined in relevant standard applied on the metering system will not affect the accuracy of recording of energy consumption and meter will work as specified in CBIP-88.
5. High Voltage High frequency, jamming injections, AC DC chopping applications	Metering system should be measuring accurately and would indicate the phenomena as tampering.

Beside above the meter should have features to detect the occurrence and restoration of, at least, the following common abnormal events:

- a. **Missing Potential & Potential imbalance:** The meter shall be capable of detecting and recording occurrence and restoration with date and time the cases of Potential failure which could happen due to disconnection of potential leads (one or two), failure of phase line fuse from the Transformer primary side. Meter shall also detect and log cases of voltage unbalance (from 5% for more than 5 minutes or more-Factory programmable)
- b. **Current imbalance:** The meter shall be capable of detecting and recording occurrence and restoration with date and time of Current unbalance (30% or more between phases for more than 15 minutes- Factory programmable).
- c. **Current Circuit Short/ bypass:** The meter shall be capable of detecting and recording occurrences and restoration of shorting of any one or two phases of current circuit to identify events like CT saturation, CT lead shorting, CT inter turns short etc.
- d. **Current Circuit Open:** The meter shall be capable of detecting and recording occurrences and restoration of opening of any one or two phases of current circuit which can happen due to intentional / accidental disconnection of current circuits. The meter shall be able to log abnormality conditions in current open event like CT leads burns, loose connection, CT winding open etc in the meter memory. No load condition should not be recorded in meter memory as a Current circuit open event.
- e. **Power on/off:** The meter shall be capable to record power on /off events in the meter memory. All potential failure as per the defined threshold value should be recorded as power off event.
- f. The meter shall be capable of recording correctly in cases of phase sequence reversal. The phase association error may occur at the time of installation and commissioning, to check the same the facility has been provided in CMRI program. This error can be checked with the help of facility of vector diagram in CMRI.

After the installation is over there is no necessity to check the same. However, whenever required it can be checked with the help of the CMRI.

- g. The meter should record accurately even when the neutral is opened and will indicate on the CMRI with the help of phasor diagram when the voltage is fed to the neutral.

The meter should record the total duration of the above abnormalities, time and date of their occurrences & restorations with a snap shot of electrical conditions viz. Voltage, current, PF etc.

The meter shall keep records for the minimum last 250 events (occurrence + restoration, occurrence & restoration will be counted as a separate event) for above of abnormal conditions. It shall be possible to retrieve the abnormal event data along-with all related snap- shots data through the meter's optical port with the help of a hand held unit (HHU) and download the same to the BCS where it will be available for viewing. All this information will be made available in simple and easily understandable format.

The meter shall also be capable to withstand and should not get damaged if phase to phase voltage is applied between phase to neutral.

26.0 TAMPER LOGIC:

Properly designed tamper event logic should be provided. There shall be separate compartments for logging of potential related event, current related event and power on/off event.

The logging of various events in each compartment should be as under:

Once one or more compartments have become full, the last event pertaining to the same compartment will be entered and the earliest (first one) – event would disappear. Thus, in this manner each succeeding event shall replace the earliest recorded event, compartment wise. Events of one compartment/category should overwrite the events of their own compartment/category only.

A properly defined meter tamper logic should be provided. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to source side abnormalities.

There shall be four separate compartments for logging of different types of tampers as follows:

Compartment No.1:

50% of the tamper memory space shall be allocated for the following current related tampers:

- a. CT polarity reversal
- b. CT open circuit
- c. CT short (bypass)

Compartment No. 2:

25% of the tamper memory space shall be allocated for missing potential and voltage unbalance.

Compartment No.3:

25% of the tamper memory space shall be allocated for Magnetic interference & Neutral disturbance tampers.

Compartment No.4:

20 no. of Power on off events shall be recorded in this compartment.

Once one or more compartments have become full, the last tamper event pertaining to the same compartment will be entered and the earliest (first one) tamper event would disappear. Thus, in this manner each succeeding tamper event will replace the earlier recorded event compartment wise. Events of one compartment/ category would overwrite the events of their own component/ category only.

27.0 TESTS:

It should be noted that, unless specifically waived off all tests will be witnessed by the DEPARTMENT OF P OWER.

27.1 Type Test:

The energy meter should be fully type tested at an NABL accredited test laboratories as per standards and certificates of same which should be enclosed with offer for our reference.

27.2 Acceptance Test

i) Acceptance test shall be carried out as specified in CBIP technical report no. 88/ IS 14697.

27.3 Routine Test

ii) All routine test as specified CBIP Technical Report No. 88/ IS 14697.

28.0 FIXING OF METERS:

Every meter should have three fixing holes, one at top and two at bottom. The top hole will be provided with a special clip at the back of the meter so that the holding screw is not accessible after the fixing of meters. The lower fixing screw will be provided under the sealed terminal cover. The requisite screws shall be supplied with each meter.

29.0 OTHER SALIENT FEATURES:

- a. It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.
- b. The meter shall have provision to be read in the absence of power, through LCD auto-display with the help of internal Battery.
- c. The meter should work accurately irrespective of phase sequence of the mains supply. There should be a provision in CMRI software to display the phasor diagram at site so that meter should be checked at site while installation.
- d. The meter should remain powered up and functional even when either of the two phases or one phase along with neutral is available to meter.
- e. The meter shall record as per the prevailing electrical conditions when neutral is disconnected & phase voltage is applied on the neutral. Also the meter shall record it as an invalid voltage tamper and register energy on reference voltage, actual current and UPF & the phasor diagram of the same can be viewed at CMRI/BCS end.

**TECHNICAL SPECIFICATION FOR PILFER PROOF METER BOX
TO HOUSE LT CT OPERATED ENERGY METER AND MODEM.**

1.0 SCOPE:

- 1.1 Specification covers the design, testing and supply of anti-corrosive, dust proof, rust proof, shock proof, vermin and water proof, U.V. stabilized and pilfer resistant meter boxes made of Glass reinforced, polyester sheet moulding compound (SMC) conforming to ISS:13410:1992 (with latest amendment thereof) for installation on distribution transformers of various ratings and LT Bulk consumers.

Meter boxes shall consist of two compartment and suitable thread through type design from 100/5A, 200/5A, 400/5A, 600/5A and 800/5A for consumer metering application.

The LT CTs are properly installed in the CT chamber of meter box with suitable mounting arrangement.

The secondary wiring from LT CTs to meter shall be carried out with 2.5 sq. mm flexible multi strand PVC insulated with colour code is also provide from C.T. chamber to meter chamber. Potential leads of similar size shall also provide to connect energy meters potential terminals to Power cable.

2.0 CONSTRUCTIONAL FEATURES OF METER BOX:

- 2.1 Meter Box shall be made of minimum 2.5 ±0.5mm. thick sheet moulding compound (SMC) conforming to ISS: 13410:1992 with latest amendments thereof. LT meter box shall contain two separate chambers. The upper chamber shall be suitable to house 3 phase 4 wire energy meter and modem .

The lower chamber of the box is intended for housing maximum 4 nos. ring type LT CTs. The appropriate size of cables from the secondary of distribution transformer shall pass through ring type LT CTs. Both the chambers of box shall be independent from each other. If any portion of box is closed it shall not be possible to approach it by opening the other portion and vice-versa. It shall be molded in a single piece forming the body of the Meter Box and CT chamber with SMC lid/shed fitted with the base by concealed hinges. The cover shall rest on the collar of the meter box body base in such a way that no access from outside is possible.

The door/cover in closed position should house properly within collar of meter box body base, which shall also house the edges of the lid/cover so that no direct entry or access is possible. The box should have a front door opening with a window provided with toughened glass (4 mm) / polycarbonate sheet (2 mm) thickness for viewing and taking meter reading as shown in the typical enclosed drawing.

The body of the Meter Box shall have such construction that while installing on the grouted bolts of base-wall, the top surfaces of the box shall have little tapering shape frame centre towards both sides of the meter box so that easy flow of rainwater etc. is facilitated.

The meter box should be anti-corrosive, rust-proof, dust-proof, vermin-proof, water-proof, The meter box becomes completely closed by providing 2 nos. sealing arrangement in the shape of two nos. latches made of zinc passivated MS sheet of minimum 1 mm. thickness which is attached by a rivet with the collar of the meter box body base and tightens the meter box body base and lid/cover when pressed. `

- 2.2 The meter shall be mounted on a SMC sheet / clamps with suitable metallic screws which shall not be protrude outside the box. The meter base supports inside the box are raised by about 10 mm in the box for ease of wiring. The meter box shall have four wall mounting provision to fix the box at wall / pole at the bottom base with suitable screws / clamps. The fixing shall not be complex and shall be easily approachable for connections when the door is in open condition and is completely tamper proof once it is sealed.
- 2.3 The meter box should neither melt nor become soft or distort when tested up to temperatures above 125⁰C. The thickness of these boxes shall not be less than 2.0 mm on all sides including floor. Soft rubber gasket shall be providing to prevent the box with dust & water.
- 2.4 The boxes shall generally comply with the provision of ISS: 14772:2000. The boxes shall be suitable for outdoor / indoor application. The box shall be with good workmanship. There should be a minimum of 50

mm clearance on all sides and 25 mm clearance on the front and 10 mm clearance on the back of the meter.

- 2.5 The meter box shall have suitable earthing bolts of M6 × 20 mm. size with Nuts & washers.
- 2.6 Suitable number of holes (4 Nos.) should be provided on both sides of C.T. chamber for cable entry and exit. (minimum 8 holes are required for above 400A rating at each side, bidder should submit drawing for approval). The size of the holes shall be depends on rating of current transformer.. High resistant PVC / HDPE , high grade, cable glands shall be provided on both sides of the box.
- 2.8 Sufficient space should be available inside the meter box for making out-going connections of the leads with the terminal block of the meter.
- 2.9 Suitable space to mount GSM Modem shall be available inside the meter mounting chamber
- 2.10 IP class of meter box shall be IP:54

3.0 RATING PLATE:

- 3.1 Following information shall be available on each meter box.
 - 1. Name of Manufacturer
 - 2. Year of manufacturing
 - 3. Type of Meter Box
 - 3. C.T. Ratio

4.0 TESTING:

- 4.1 The meter boxes shall be subject to type tests, routine tests and acceptance tests conforming to ISS: 13410: 1992 read with ISS: 13411, ISS: with intent amendment thereof. as per details given below.
 - a. Water Absorption Test.
 - b. Heat distortion Test.
 - c. Test for Dimensions
 - d. Test for mechanical strength.

**TECHNICAL SPECIFICATIONS FOR 3 PHASE 4 WIRE AC WHOLE
CURRENT STATIC METER (AMR COMPATIBILITY)**

1.0 SCOPE:

- (a) The scope covers design, engineering, manufacture, assembly, inspection, testing, at manufactures works before dispatch packing, supply and delivery at different circle and area stores including insurance during transit of class 1.0 accuracy, LT 3-phase, 4-wire, 240V system static Whole Current electronic meter of current range 10-60A or 20-100A, with backlit LCD display, CMRI & Base computer software for tariff purpose with TOD features along with tamper proof meter box. The meter would be for balance & unbalance load and capable of recording and displaying energy in KWh and demand in kVA & kW, power factor range of Zero lag-unity-Zero lead. Meter would have facility / capability of recording tamper information & load survey in active, apparent & reactive energy & phase currents.
- (b) The Bidder should note down the contents of the clause.

The Bidder should note down the contents of the clause and required BIS certificates are enclosed along with the offer.

The metering system should be flexible enough for changing requirements in future and designed for minimum maintenance. The meters shall be installed with fully wired weatherproof, polycarbonate pilfers proof Meter Box.

The meter box should have capability to house the modem.

2.0 STANDARDS APPLICABLE:

The performance & testing of the supplied meters should conform to the following Indian/ International standards, to be read with upto-date and latest amendments revisions thereof:

Sl. No.	Standard No.	Title
1.	IS 13779, 1999 read with its latest amendments.	A.C. Static Watt-hour Meters, Class 1.0 &2.0
2.	CBIP Technical Report 88(revised JuIy,'96) & 304.	Specification for AC Static Electrical Energy meters of CBIP with its latest amendments.
3.	IEC 687/62053/61036	Alternating current static watt-hour meters for active energy (Class 1.0)
4.	CBIP Technical Report 111	Specification for Common Meter Reading Instrument
5.	IS 13410- 1992 with latest amendment	Specification for Pilfer Proof Meter box Suitable for 3- Ph static Energy Meter

3.0 CLIMATIC CONDITIONS:

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

- i) Maximum Ambient Air Temperature in shade: 55°C
- ii) Minimum Ambient Air Temperature: (-) 10 deg C
- iii) Maximum Relative Humidity: 95% (Non-condensing)

iv)	Minimum Relative Humidity:	10%
v)	Height above mean sea level:	Upto 1000 meters
vi)	Average number of tropical monsoon per Annum:	5 months
vii)	Annual Rainfall:	100 mm to 1500 mm
viii)	Max. Wind Pressure:	150 Kg/ sq.m.

4.0 TROPICAL TREATMENT:

The meters shall be suitably designed and treated for normal life and satisfactory operation under hot & hazardous tropical climate conditions and should be dust and vermin proof. All the parts & surface, which are subject to corrosion, will either be made of such material or will be provided with such protective finish which provides suitable protection to them from any injurious effect of excessive humidity.

5.0 BRIEF ELECTRICAL SPECIFICATION:

Class of accuracy	:	Three phase four wire whole current meter of 1.0s (No drift in tolerance of accuracy with time) (The offered Meter should record energy at 1% Ib at UPF Preferably with an error band + 2% in balanced load; when all the 3 phases are connected to meter)
Supply Voltage	:	240V, (—40% to +20%), 3X240V Phase to Neutral Voltage variation; when all the 3 phases are connected to meter)
Frequency	:	50Hz 5%
Current Range (basic)	:	5 Amp.
Maximum Current	:	200 Amp.
Starting Current	:	0.2% of Ib at UPF
Power factor range	:	Zero (lagging)—Unity—Zero (Leading)
Power Loss	:	Voltage Circuit Less than 1.5W / 8 VA Current Circuit with 1.5 Watt and 4 VA
Resistance to Impulse voltage	:	Minimum 10kV peak
Resistance to surge voltage	:	Minimum 8KV peak of 1.2/50 Micro sec.
Test Voltage at 50 Hz for 1min	:	4 KV rms — as per IS 13779
Clock time accuracy	:	±3 min/year. As per CBIP 88

6.0 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 offer. The same is indicated in Clause 5.0 above.

7.0 CONSTRUCTION:

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance under all conditions especially during heavy rains / very hot weathers. The insulating materials used in the meter would be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter must result in viable damage to the meter cover. This should be achieved by using continuous Ultrasonic welding on the Meter body.

The meter should comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter should be of high quality and there should be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter should be compatible with 16 Bit (or better) ASIC with compatible processor and meter should be based on Digital measuring and sampling technique.

The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base must be opaque grey. The meter casing should not change shape colour, size and dimensions when subjected to 200 hrs on UV test as per ASTM D 53. It should withstand 650°C glow wire test and heat deflection test as per ISO 75.

The meter cover should be sealed with the meter base by 2 (Two) seals.

8.0 METER CASE AND COVER:

The meter should have a case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal and cover. This shall be achieved by use of seamless welding. (Ultrasonically continuously welded at all sides so that the cover cannot be separated from the basic without breaking/damaging the case & cover).

The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.304. Meter should record energy at I_{max} UPF with stamping if not immune.

9.0 TERMINAL BLOCK AND COVER :

The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with tinned/nickel plated brass inserts for connecting terminals.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor with the help of screw adjustable metal plates to increase the surface of contact and reduce the contact resistance. The screws shall have thread size not less than M4 and head having 4-6 mm. Diameters. The screws shall not have pointed ends at the end of threads. All terminals and connecting screws should be of tinned / nickel plated brass material. The terminal Block & Cover would withstand glow wire test at 960 +/-15°C and the terminal should withstand at least 135°C as per IS.

The internal diameter of terminal hole should be minimum 9.5 mm and center to center distance is 13 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

The terminal cover shall be transparent Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover should be sufficient to accommodate adequate length of external cables.

10.0 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 will also be there):

- a) Manufacturer's name & trade mark
- b) Type Designation
- c) No of phases & wires
- d) Serial Number (Size not less than 5 mm)
- 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 **“DEPARTMENT OF POWER, ARUNACHAL PRADESH”**
- m) Contract Agreement No. and Date
- n) Guarantee (Guaranteed for a period of 5 Yrs.)
- o) BIS marking
- p) Place of manufacture
- q) Meter Sl. No. in alpha numerical form, Month & Year of manufacturing, Rating of the meter should be bar coded.

11.0 DISPLAY OF MEASURED VALUES:

The meter shall have Alphanumeric display with 7 full digit with LCD backlit display, having character height of 10 mm. The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under un-powered condition. We have noted that Battery back-up memory will not be considered as NVM. It should be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciator.

The register shall 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. In addition to provide Serial Number of the meter on the display plate, the meter serial should also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.

The Bidder should noted that visibility of display in poor light conditions is an important criterion. STN type of LCD shall be used. Proper annunciation for the displayed parameters shall be provided (Factory programmable).

The meters should have auto-display mode for pre-selected parameters. Push-Button mode of display should display all parameters and it should have priority over auto mode. The meter should give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with first occurrence and last restoration date & time.

The meter shall have a test output (blinking LED) accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device should be provided in the form of two LED, one LED for active and one common LED for reactive & apparent energies with the provision of selecting the parameter being tested.

Meters should have calibrating LED pulse output for Energy Vectors. The meter should also record values of Energies at present date & time and last 12 months.(Factory Programmable).

12.0 DISPLAY SEQUENCE :

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

Display sequence for both Auto and Push button shall be maintain, the Bidder should be noted that any interchange between the display parameters is not accepted:

Display parameters of Three phase whole current meter:

Sr. No.	Auto Display/Billing Parameters	Sr. No.	Push Button Display
1.	LED/LCD Test	1.	Frequency-Hz
2.	Meter Serial Number	2.	Instantaneous phate to Neutral Voltage - Vr-N- Vy-N- Vb-N-
3.	DATE	3.	Instantaneous Line Current - Ir- Iy- Ib-
		4.	Instantaneous Load- kW
		5.	Instantaneous Load- kVA
4.	TIME	6.	Instantaneous Power Factor
5.	Previous month-M. D-KW	7.	Date & Time of previous month - MD-KW
6.	Previous month - P.F.	8.	Previous month end reading-KWH
7.	Current cummulative reading- KWH	9.	Previous month end reading-KVAH
		10.	Previous month-M.D.-KVA
		11.	Previous month-Power on Hours
		12.	Previous month- Tamper Count
		13.	Maximum Demand- kW, Date & Time: kVA
		14.	Current Ckt related present Tamper Status
		15.	Voltage Ckt related present Tamper Status
		16.	Other Tamper Status
		17.	Last Occurrence Tamper Date & Time:
		18.	Cummulative Power ON Hours
		19.	Cummulative Tamper Occurrence
		20.	Current Cummulative reading-KVAH
		21.	M.D. Reset count-
		22.	Previous 3 months maximum kW, kVA
		23.	Circuit OK

13.0 ANTI TAMPER FEATURES:

The supplied meter should have the following anti-tamper features:

- i) The meter should be capable of recording energy correctly even if the input and output terminals are interchanged.
- ii) The meter should work correctly irrespective of phase sequence of supply.
- iii) The meter should work as per IS13779 in absence of neutral. However in case of unbalanced load or unbalance voltage the meter shall work as per prevailing electrical conditions.
- iv) The meter should work correctly if one, two and all three phase current direction is reversed.
- v) The meter should work in absence of two phase and record relevant energy on any one phase & Neutral or any one phase & earth.
- vi) The supplied meter shall have link less design.
- vii) The Meter should record energy with maximum error of + 4% or as per prevailing electrical conditions on injection of DC in neutral, injection of pulsating DC (7-10Hz) in neutral. DC voltage rectified from a three phase power supply shall be applied for continuous DC injection.

- viii) The Meter should meet accuracy under magnetic influence as per CBIP 304 latest amendments .
No abnormal behavior like flickering, switching on-off of display, abnormal heating etc would be observed during magnet test. Meter would record energy at I max with Tamper logged, if it gets affected from magnetic influence.
- ix) Meter should record energy either with error of $\pm 4\%$ or should record at I_{max} on injection of chopped AC in neutral. However meters which are immune or maintain better accuracy, shall be preferred. Maximum chopping for AC injection would be 25% to 30% at peak end.
- x) The registration should not affected more than $\pm 4\%$ if external A.C. or High frequency voltage is applied to the meter neutral w.r.t. earth (**up to 450V, 1kHz**) (**meter will record energy as per IS**)
- xi) 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 shall be conducted by using commonly available devices and during spark discharge test, spark shall be applied directly at all vulnerable points i.e. at Push Button, Optical Port, Terminal Cover ends, Junction Points between Base and Cover & Terminal Points of the meter for a period of 10 minutes (0-10 mm spark gap) and meter should record under this condition. After application of spark discharge meter should record correctly within the specified limits of errors.

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

- Missing Potential for all phases.
- Voltage unbalance (If $V_{max} - V_{min}$ is greater than 30 % of V_{ref})
- Current reversal for all phases.
- C.T. Open/ C.T. Short/ Load or current unbalance etc.
- All potential missing or Power failure.
- Magnetic Disturbances (IS 13779 & CBIP 304)
- Neutral disturbance due to AC/DC abnormal signal (if not immune)

Snapshot values of Phase Voltage, Line Current & Phase wise Power Factor, Active Energy value during occurrence & restoration shall be provided in the above mentioned for all tamper conditions (up to 300 events i.e. Occurrence and restoration) in BCS.

The duration of tamper before it is logged should be a user programmable (factory) through authenticated commands. (But it should not be more than 10 min.) All authenticated commands should be Base Computer Software controlled.

All transactions with meter should be date & time logged (minimum last 5 transaction).

A minimum of 300 events (one event means either occurrence or restoration) of all types of tamper with date & time stamping must be available in meter memory. The logging shall be on FIFO basis.

Meter should have an indication in its display if top cover is removed / open, and it must be logged in BCS also.

13.1 **Measurement of Harmonics:**

The meter should be capable of measuring fundamental energy as well total energy i.e., fundamental plus Harmonics energy. Total energy shall be made available on meter display and the same only shall be used for billing purpose. Provision for measuring of fundamental energy should be kept for utilization in future.

The total energy & fundamental energy shall be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

14.0 **RESETTING OF MAX. DEMAND:**

The meter should be capable of recording the Apparent MD with integration period of 15 minutes (programmable). The meter should also record MD at preset date and time.

MD reset should be through all of the three means:

- 1) Manually
- 2) Through authenticated MRI and Remote Communication Command,
- 3) Automatic resetting at 00.00 Hrs at first day of the month.

Facility to invoke any of the above through authenticated MRI command would be provided. By default the M.D. reset will be through push button on any date of the month. MD reset button should have proper sealing arrangement.

Push button for scrolling display & MD reset would be separate. Push button on the meter case should be such that the push button can be operated without opening the meter box.

15.0 LOAD SURVEY:

The meter should be capable of recording load survey for the following parameters for a period of minimum 90 days with 30 minutes integration period.

- i) Demand in KW,
- ii) Demand in KVA

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

It should be possible to transfer this data to base computer software through MRI. The data so obtained should be displayed in both graphical & numeric form in the BCS. The BCS with all details shall be provided by the Contractor at no extra cost.

16.0 TIME OF DAY FACILITIES:

The meter should have facilities to record Active, Apparent Energies and MD in at least 8 zones. The time zones should be user programmable through authenticated MRI command. Necessary software and training of officers for the same shall be provided by the Contractor.

At present TOD timings shall be programmable as follows:

- | | |
|---------|-------------------------------------|
| TOD — 1 | 05:00 Hrs to 17:00 Hrs, |
| TOD — 2 | 17:00 Hrs to 23:00 Hrs, |
| TOD — 3 | 23:00 Hrs to 05:00 Hrs of next day. |

17.0 METER READING DURING POWER OFF:

It should be possible to read the meter-display visually and with MRI in absence of input voltages with the help of internal battery backup.

Separate battery should be used for this purpose (Not RTC or processor battery).

18.0 SELF DIAGNOSTIC FEATURES:

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. The details of malfunctioning should be recorded in the meter memory.

The Contractor should furnish the details of self-diagnostic capability feature.

19.0 IMMUNITY TO ELECTRO MAGNETIC & ELECTRO STATIC DISTURBANCE:

The meter should be designed in such a way so that external electromagnetic field or electrostatic discharges do not influence the performance of the meter.

Supplied meter must log events as per clause no. 13 with date and time stamp.

20.0 TECHNICAL SUPPORT, MANUALS & TRAINING:

Extensive technical support, detailed technical literature & training shall be provided by us.

21.0 INFLUENCE QUANTITIES:

The meter shall work satisfactory with guaranteed accuracy as per limit as per limit or relevant IS under presence of the following quantities:

- i) Electromagnetic field
- ii) External magnetic field
- iii) Radio frequency interference
- iv) Vibration
- v) Voltage fluctuation
- vi) 35KV Electrostatic field
- vii) Harmonics Distortion as relevant IS and IEC.

22.0 POWER CONSUMPTION BY METER:

Voltage Circuit: The active and apparent power consumption in the voltage circuit (all 3 phases) including the power supply of meter at reference voltage, Reference temperature and reference frequency should not exceed 1.5 Watt and 8 VA respectively (including all phases).

Current Circuit: The apparent power taken by each current circuit (all 3 phases) at basic current, reference frequency and reference temperature should not exceed 4 VA (including all phases).

23.0 STARTING CURRENT:

The meter should start registering energy at 0.2 % of basic current at unity power factor and would be fully functional within five seconds after the rated voltage is applied.

23.1 RUNNING AT NO LOA QD:

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.

24.0 COMMUNICATION CAPABILITY:**(a) Local Communication Mode:**

The meter shall have a galvanically isolated optical communication port IEC 1107 so that it can be easily connected to a hand-held common meter reading instrument (CMRI) for data transfer. The billing data & the tamper data downloading time should be less than 2-3 minutes. The optical port should be provided with proper sealing arrangement so that the optical cover should not be opened without breaking the seal. The stored data in the meter should be available through CMRI even when the display of the meter is not available using internal battery.

The above ports suitable for interface of the meter with appropriate protocol to Common Meter Reading Instrument (CMRI) / LAPTOP / PC.

(b) Remote communication Mode:

The offered meter shall have a separate RS232 port for connection of MODEM to be procured separately. On procurement of GSM/GPRS MODEM the meter should be capable for remote communication. Meter should have provision of power supply of modem.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. 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 alteration, change should be possible through authenticated commands sets by the BCS without scheduling the meters. Moreover, no alternation change should be possible using CMRI only, i.e. the control has to be with the BCS.

The BCS shall have multi-level password for data protection & security.

50 nos. Meter to CMRI communication cord, 50 nos. BCS & 40 nos. seal tracking software should be supplied to the DEPARTMENT OF POWER, GOVERNMENT OF ARUNACHAL PRADESH for distributions at sites. Seal tracking software should be submitted and installed at PC / Laptop of the owner before commencement of supply of the meters i.e. it shall be supplied before/at the time of offering first lot inspection.

25.0 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

The Common Meter reading Instrument (CMRI/Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI/Laptop.

The BCS should be WIN Xp, WIN vista, Win 7 pro based and copy righted.

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

This BCS should have, amongst other requirements, features and facilities described later in this offer, the facility to convert meter-reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, and history data should be convertible to user defined ASCII file format for integration with third party software. The Contractor should supply necessary base computer software for reading/viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The Contractor should also supply the necessary Laptop software (during sample testing also).

Supplied meter shall be based on open protocol hence API is not required. 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, shall be done by us at our cost.

The software should be capable of preparing CMRI to read the meter information or to reconfigure the meter for change of TOD timings and / or time setting of the meter.

The exhaustive help should be available with the software so that user can use all the features of the software by just reading the help contents.

In BCS 12 months back-up data for KWh, KVAh, MD in KW & KVA (total & TOD wise), Average power factor must be available.

26.0 ACCURACY:

There shall be no drift in accuracy, for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the Contractor will re-calibrate / replace by a new meter without any extra cost.

**TECHNICAL SPECIFICATION FOR PILFER PROOF METER BOX TO
HOUSE THE THREE PHASE WHOLE CURRENT METER AND MODEM**

The meter box shall be suitable to house one number of three-phase four-wire direct connected energy meter and provision for modem. The meter box shall comply with Indian Standard IS: 14772:2000

1.0 MATERIAL

The meter box shall be made of Transparent Polycarbonate material with following properties

- i. Flame Retardant
- ii. HDT – 120 ±5°C
- iii. Flame Retardant
- iv. Withstanding temperatures of boiling water for 5 minutes continuously without distortion or softening.
- v. Withstanding Glow wire test at 650°C as per IS: 11000 (Part 2 Sec 1).
- vi. Environment friendly and easily recyclable.

2.0 CONSTRUCTION

- i. Meter Box shall have a roof tapering down to both sides for easy flow of rainwater.
- ii. The thickness of the box shall not be less than 2.5 mm from load bearing side (i.e. back side of the box) and other sides, doors & roof shall not be less than 2.0 mm.
- iii. The overall minimum dimensions of the box shall be minimum 370 x 280 x 110 mm. box dimension shall be different as per meter dimensions, however minimum dimension should be maintain.
- iv. Minimum side clearance should be maintain in between meter & side wall of meter box. Minimum Clearance from both sides 50mm, top side 50mm, front side 25 mm, back side 10 mm and 75 mm from the terminals of energy.
- v. Box cover shall be fixed with minimum two nos. hinges, well protected against corrosion. Box cover shall be able to open by more then 120 degrees.
- vi. Soft rubber gasket for protection from ingress of dust and water shall be provided on all around the box.
- vii. Handle shall be provided on the Box door for easy door opening.
- viii. For holding and sealing the door, U-shaped latches/clamps with one sealing hole shall be provided. Latches shall be riveted on the base of the box. Two such latches shall be provided. These latches will also hold the box cover with base. All metallic parts shall be protected against corrosion.
- ix. The box colour shall be Transparent
- x. Box shall be provided with 4 nos. fixing holes of 6 mm diameter at all four corners of meter box.
- xi. Meter Box should comply IP-54.
- xii. For cable entry, suitable circular holes fitted with Engineering Plastic / HDPE glands shall be provided at the bottom of the box for cable inlet and outlet. The internal diameter of the gland shall be such as to accommodate the 25-27 mm outer diameter cable.
- xiii. Purchase order No. & Date shall be provided on metallic name plate in such a manner that it shall not be removed easily. Name of Manufacturer shall be embossed on meter box cover.
- xiv. Push button shall be provide on the cover of meter box to operate the meter push button without opening the meter box cover.
- xv. Arrangement for meter reading through Meter reading instrument should be provide on meter box cover to read the meter without opening the meter box cover. Suitable sealing arrangement shall be provide.
- xvi. Drawing of offered meter box should be enclosed along with bid.

3.0 TESTS :

3.1 Type Tests:

The following tests are to be conducted on the box / similar type of box from any independent NABL approved test laboratory. Test will be carried out as per IS: 14772 or other equalivent standard.

- i) Test of material identification
- ii) Test for mechanical strength.
- iii) Test for stability at high temperature.
- iv) Test for withstanding temperature of boiling water for 5 minutes continuously for non-distortion or softening of material.
- v) Glow wire test at 650°C for 30 Seconds.
- vi) Heat deflection test (HDT) 120 ±5°C

4.0 Acceptance & Routine Tests:

4.1 Acceptance Tests:

The following shall constitute acceptance test for box:

- i. Physical verification of dimensions of the box.
- ii. Compatibility of the box for housing the meter for ensuring ease of connections and reading the meter.

4.2 Routine Tests:

Following Routine test certificates shall be furnished for approval.

- i. Physical verification of the box.

TECHNICAL SPECIFICATION FOR INTELLIGENT GSM/GPRS MODEM.

1.0 SCOPE:

The scope covers the supply of intelligent GSM/GPRS modem and alongwith suitable accessories for automatic and remote data transfer from Electronic energy meters.

The overall system setup shall consist of the following:

Meter end -

- GSM (GPRS enabled)/EDGE modem
- Suitable communication cable between modem and meter- 2 Nos. cables 1 for optical port & other for RJ 11 port.

Central Station :

- Suitable Base Computer Software compatible for GSM/ GPRS
- For communication over GSM/GPRS network -
 - GSM/GPRS modem
 - Suitable communication cable between modem and PC
- For communication over GPRS network -
 - Public Static IP with sufficient bandwidth
 - Server and Client machines for AMR
- For sending SMS from central station:-
 - GSM Modem
 - Suitable communication cable between modem and PC.

2.0 TECHNICAL REQUIREMENTS:

The supplied modem shall be suitable for communication with electronic energy meters. The system shall be used for remote meter reading of the electronic energy meters via GSM/GPRS infrastructure.

Various features of GSM modem (to be installed with electronic energy meter) are described as below:

2.1 Power Supply Section:

2.1.1 Input specifications:

2.1.1.1 The modem shall have an AC input supply of 110V/230V \pm 30%, 50 Hz \pm 5%.The modem should be capable of proper functioning within the power supply range of 50 to 540V AC.

2.1.1.2 Average Power consumption of the modem shall not be more than 5 VA under idle condition and 8 VA during data transfer.

Note: Power consumption may vary from site to site depending on signal strength at that particular location. Above values are typical values.

2.1.2 Withstand capacity against surges would be according to Indian conditions i.e. 6.0 kV.

2.2 GSM/GPRS Section:

2.2.1 The GSM/GPRS module shall comply with the following:

2.2.1.1 The modem shall be operate in Dual Band GSM 900/1800MHz.

2.2.1.2 The modem shall be compliant with ETSI GSM Phase 2+ Standard.

2.2.1.2.1 Class 4 (2W) @ 900 MHz

2.2.1.2.2 Class 1 (1W) @ 1800 MHz

2.3 GPRS Data transmission features:-

2.3.1 GPRS class B Multi slot class 10

2.3.2 Packet channel support : PBCCH

2.3.3 Coding Schemes: CS1 to CS4 compliant with SMG32 (Release 97)

2.4 SIM Card Section:

2.4.1 For placing the SIM Card, a SIM Card Holder shall be provided on the modem and shall be accessible from outside without opening the modem enclosure.

2.4.2 The SIM Card supported shall be of 3V Interface.

2.4.3 Suitable Locking facility shall be provided on the device cover.

2.5 Communication Interface:

2.5.1 The modem shall be suitably pre-configured for remote meter reading application.

2.5.2 A RS232 Serial Link supporting up to 115,200 bauds with an auto-bauding option shall be provided. However the data transfer rate for remote meter reading shall be depend on meter compatibility.

2.5.3 The RS232 output shall be provided on a 9-pin female connector which can be connected to electronic energy meter's optical/serial communication port through suitable communication cable.

2.6 RF section:

A SMA interface shall be provided on the GSM modem to wired (with magnetic base) Dual Band Antenna of minimum 5db gain can be connected. Connecting cable shall of suitable length.

2.7 Network Identification Section:

For determining the health of the device, multiple LED shall be provided on the modem which should depict the current functioning status (power up/ registered in network/ signal strength/ transmitting data).

2.8 EMI/EMC Specifications:

The GSM modem must meet the following EMI/EMC specifications:

2.8.1 Electrostatic Discharge IEC61000-4-2

2.8.2 Fast Transient Burst IEC61000-4-4

2.8.3 Surges Immunity IEC61000-4-6

2.8.4 Conducted Emission CISPR22 (class B)

2.8.5 Impulse voltage test IEC6100-4-5

2.8.6 AC Voltage test IS 13779-1999

2.9 Mechanical Specifications:

The Mechanical Specifications of the modem shall be as follows:

2.9.1 Mounting Arrangement: A suitable wall mounting arrangement shall be provided.

2.9.2 The GSM modem shall comply with IP51 rating.

2.9.3 Sealing Arrangement: The Top and Base Cover shall have a suitable sealing arrangement so that the GSM SIM Card cannot be tampered with.

2.9.4 The modem shall be housed in an enclosure of engineering plastic.

2.10 Environmental specifications:

The modem shall meet the following environmental specifications:

2.10.1 Temperature: -10 degrees to +55 degree

2.10.2 Humidity: 95% RH (non – condensing)

2.11 Functional specifications:

The modem should be an intelligent device and capable of providing the following functionalities on GSM/ GPRS network with suitable Base Computer Software:

2.11.1 The modem shall be properly configured via suitable Base Computer Software to enable its intelligence mode.

2.11.2 The modem should be capable for data transfer to central station as per configuration via suitable BCS. Modem should respond to dialing from central station and should transfer electronic energy meter data directly in transparent communication mode.

2.11.3 Modem shall support intelligent mode for fast data transfer and it should be possible to get the data available in the modem by dialing from central station.

2.11.4 The Bidder should note the contents of the clause.

**TECHNICAL SPECIFICATION FOR 11 KV 3 PHASE 4 WIRE CT PT
COMBINED METERING SET OF ACCURACY CLASS 0.5s**

1.0 SCOPE:

This specification covers design, manufacture, testing at manufacture's works and inspection, supply and delivery of oil filled conventional type outdoor type pole mounted combined 11 KV copper wound CTPT unit.

The combined CTPT unit shall comprise of three single phase Current Transformers and 1(one) Three phase voltage transformers having primary star point of primary winding without EARTHED (i.e. floating neutral and secondary star neutral points shall not be EARTHED on LV side and shall be brought out on secondary terminal Box.

2.0 OPERATIVE CONDITION:

The CTPT units to be supplied against this specification shall be suitable for satisfactory continuous operations under the following tropical conditions.

3.0 AMBIENT CONDITIONS:

- a) Maximum ambient air temperature not exceeding: 50⁰C
- b) Maximum daily average ambient air temperature not exceeding: 35⁰C
- c) Maximum yearly average ambient air temperature not exceeding: 30⁰C

4.0 ALTITUDE: Upto 1000 meters above Mean Sea Level.**5.0 INSTALLATION:**

Outdoor poles mounted in atmosphere normally get polluted. The CTPT units shall also function satisfactory if installed in Sea Shore area having saline atmosphere and in chemically polluted areas.

6.0 SYSTEM:

3 Phase, Frequency 50 Hz + 10%

Voltage = 11 KV

It is also pertinent to state that commonly the system may be contained of various type and order of Harmonics generated by consumers. In view of which adequate care shall be taken in design and manufacturing of unit. The remedial measures taken or proposed to be taken shall be intimated in detail with technical write up.

7.0 APPLICABLE STANDARDS:

Unless otherwise specifically stated, the specifications of CT-PT Units shall conform to the latest version to the following standards:

- IS-2705 Current transformers
- IS-3156 Voltage transformers
- IS-5621 Hollow porcelain isolator or bushing
- IS-3347 Dimensions for bushings
- IS-335 New insulation Oil
- IS-2062 Structural Steel (Std. quality)
- IS- 5 Colors for ready mix paints
- IEC-185 Current Transformers
- IEC-186 Potential Transformers
- IS-2629 Galvanizing

8.0 DATA SHEET:

Sr. No.	Description	CT	PT
1	Type	Three Single phase	One three phase Star/Star
2	Accuracy Class	0.5S	0.5s
3	Rated frequency	50 HZ	50 HZ
4	Rated primary current	10,15,20,25,30,40,50,75,100,125,150,175,200A	N/A
5	Rated secondary current	1 Amps	N/A
6	Rated primary voltage		11KV/ $\sqrt{3}$
7	Rated secondary voltage		110/ $\sqrt{3}$
8	Rated burden	5 VA at (0.8 lagging PF)	30 VA (0.8 lagging PF)
9	Rated voltage factor		1.5 continuous and 1.9 for 30 sec.
10	Current Density	1.5 A/sq.mm.	
11	Short circuit current withstand time	6.4 KA for 1 second	
12	Dynamic current	16 KA	
13	Power frequency withstand voltage on primary winding	28 KV for one minute	28 KV for one minute
14	Power frequency withstand voltage on secondary winding	3 KV for one minute	3 KV for one minute
15	Lightning Impulse withstand voltage	75 KV	75 KV
16	Winding materials	Copper	Copper
17	Class insulation	A	A
18	Instrument Security Factor	Less than 2.5	
19	Maximum allowable temperature rise	50 °C	50 °C

9.0 BUSHING:

- a) Brown glazed HV bushing of approved make shall mounted as stated in 4(e) of Annexure-I on top cover of tank. The list of approved suppliers for Porcelain insulators may be obtained from this office. The hollow porcelain bushings shall be confirming to IS-5621. The metal parts of the bushings shall be tinned copper with minimum tinning with 50 micron with spring washer and plain washer (minimum 2.0 mm thick electroplated) with 3 (three) nos. nuts, one lock nut and two nuts for terminal connections
- b) Bushing clamping and accessories together with the connected bolts/studs shall be hot dip galvanized. However, nuts and washers shall be SS-304.
- c) Arcing horn should be avoided.
- d) Suitable bird guard will be required for all HT bushings

10.0 TRANSFORMER OIL:

- 10.1** The transformer oil to be supplied in the CTPT tank shall be new oil conforming to requirements as stated in Annexure-II when tested according to IS-335/1983.
- 10.2** The current transformer shall be so constructed as to ensure that the oil does not flow or leak out even when the current transformer is used continuously at the maximum allowable temperature; similarly the potential transformer shall be so constructed as to ensure that the oil does not flow or leak out.

10.3 Oil should be filled up to the top of HT side bushing, hence necessary provision should be made for expansion of oil due to rise in temperature

11.0 TANK:

The tank shall be fabricated from fresh MS Sheet of 4mm, thickness for top cover, flange and bottom of the tank and of 2.5mm thickness for side walls so as to withstand pressure built in during the expansion of oil during temperature rise or forces generated during short circuit. The expose fabricated tank with cover and other ferrous fittings shall be thoroughly cleaned, scrapped process and hot dip galvanized as per relevant IS-2629. All nuts, bolts, washers, screws, etc. exposed to the atmosphere shall be of 304 grade of stainless steel.

The curb of the tank shall be minimum 40mm wide. The top cover shall have slope of minimum 10 degree to drain off water in rainy season. The oil resistant gasket of neoprene rubber or nital or synthetic rubberized cork of minimum 5mm thickness shall be provided. Adequate number of SS-304 grade bolts of M12 x 35mm (length) size bolts at maximum 85mm (with tolerance of mm) C/C apart with 2 mm thick washer of 304 grade SS shall be provided. Four numbers of lifting lugs of 5mm thickness shall be provided on tank sides and two nos. on top cover. The top cover should be fabricated in such a way that nowhere the top cover gasket is exposed to air.

Suitable PRV are to be placed on the top cover of the tank to prevent explosion.

Note:- No inspection cover on any side / face of the CTPT top or base shall be provided.

11.1 TERMINAL BOX:

The terminal box shall be closed box type, water/vermin proof with tinned copper terminals of minimum 6mm dia x 35mm with electroplated spring washers and three numbers nuts. The terminal marking and polarity marking shall be done by etched aluminum square plated duly fixed in irremovable manner. The terminal box shall have cable entry hole to accommodate metallic gland (approx of 1.1/4" size) suitable to termination of 10 core, 2.5 Sq. mm PVC insulated steel armored cable. The terminal box covers shall have the provision of sealing the terminal box for which minimum Four nos. of corner bolts to be fixed on the flange of the box shall be provided with adequate hole on the bottom for sealing purpose. The terminal box with the cover closed and cable in position must have degree of protection conforming to IP-54. The minimum projection of the box shall be 70mm.

The Serial number, ratio, and date of dispatch shall have to be ENGRAVED on side (opposite to secondary terminal box), of tank with letter of suitable depth and 25mm height filled with RED color.

The fabrication of the CTPT set tank shall be such that there should not be any oil leakage from welded positions.

The four numbers corner bolts of top cover shall have suitable hole for inserting sealing wire.

12.0 FITTING AND ACCESSORIES:

The following fittings/accessories are to be provided to the CTPT units.

a)	Drain plug 19mm (3/4" size) at the bottom of the tank with pad lock.	1 No.
b)	Oil level Gauge	1 No.
c)	MS earthing terminals with two nos. nut & bolts and washer with earth symbol	2 Nos.
d)	Rating and terminal marking plate (Etched All) riveted to tank. (The rating plate shall have all details as per IS-2705 and 3156.	1 No.
e)	Lifting lugs of minimum 5mm thick	2 Nos. on top cover and 4 Nos. on tank side
f)	Base mounting channel MS 75m x 40mm x 6mm	2 Nos.
g)	Oil filling hole with cap	1 No.
h)	PRV	1 No.

i)	i) HV porcelain bushings of approved make as per Annexure-I. If the supplier wants to use any other make bushing, then it should be got approved from DEPARTMENT OF POWER, GOVERNMENT OF ARUNACHAL PRADESH before use and it should be clearly indicated. ii) LV terminals (Minimum 6mm dia) tinned copper with spring washer, plain washer and nuts with phase and polarity marking etched plated. iii) 30 mm Double Compression – Flame Proof metallic Gland iv) Bird guard for HT side bushings	As required
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13.0 CORE:

13.1 CORE MATERILAS:

Non aging oxide film coated fresh suitable Mu-metal or Mu-metal plus CRGO toroidal cores for CT. For lamination of PT first quality laser grade CRGO shall be used as core material. All the stresses developed due to cuttings, punching etc. shall be relieved by suitable stress relieving process.

13.2 CORE CONSTRUCTION AND DESIGN:

Core is supporting steel and insulation shall be such that harmful changes in electrical and physical properties shall not occur during the life time of the CTPT unit.

Core winding shall be strongly braced so that it shall not get displaced in operation due to shrinkage on short circuit forces. Core assembly shall be rigidly clamped with M.S. Channel and mounted to the tank.

13.2 CORE OF PT:

The core of PT shall be effectively earthed by copper braided flexible wire of minimum area of 40 mm² cross-section. The core shall be rigidly branched with insulated bolts and the assembly shall be rigidly clamped with MS Channels and mounted on the tank.

13.3 CORE OF CT:

The tenderer shall provide toroidal core only. It should be same as given in type tested unit. Core / Winding assembly of CT shall be rigidly mounted in the tank.

14.0 WINDING:

14.1 It shall be of electrolytic grade copper conductor with super enameled Insulation, conforming to relevant ISS. The winding design and contraction shall be such that it shall withstand impulse voltage. The details as per Guaranteed Technical Particulars shall be provided. The winding shall be preferable in two sections.

14.2 CT WINDING :

It shall be of electrolytic grade copper conductor with DPC/DCC and super enameled insulation conforming relevant ISS. The winding design and construction shall be such that it shall withstand impulse voltage and short circuit currents. The winding shall be provided with rigid insulating supporting hylum sheets of minimum 3 mm thickness on both the sides duly tightened by insulating fasteners only and by cotton cord etc.

- a) Each coil shall be wound of paper insulated, continuously, smooth high grade, electric copper conductor.
- b) The materials used in the insulation and assembly of the winding shall be in-soluble, non-catalytic and chemically inactive in the transformer oil.
- c) Winding assembling shall be dried in vacuum thoroughly shrunk to final alignment and vacuum impregnated with tested transformer oil.
- d) Design arrangement, insulated and assembly of the winding on the core shall be so as to ensure uniform distribution of voltage amongst all coils.

15.0 CONNECTIONS:

No joints in the primary winding of CT shall be acceptable. The connections to bushing terminals shall be with flexible copper strip / rope of adequate current carrying capacity. The leads shall be properly terminated with a crimped lug only.

16.0 ASSEMBLY:

Three phase CTPT combined units having specification / construction as referred above shall be rigidly fixed in the tank.

The core and coil assembly shall be supported rigidly with suitable M.S. Channels. Suitable guides shall be provided to avoid displacement of active parts.

The inner clearance between live parts to tank shall be minimum 50mm for 11KV CTPT set. The drawings shall clearly indicate the inner clearance in detail. General Arrangement Drawing should be sent with offer for approval.

17.0 CABLE DETAILS:

The terminal box shall have cable entry hole of size 38mm dia. with 1.1/4 inch double compression flame proof metal cable glands to avoid cutting of cable sheath. The terminal box shall have provision to seal the terminal box.

18.0 CLEARANCE:

The minimum air clearance for HV shall be as per IS-3347.

19.0 DRAWINGS:

The detailed dimensional drawings – 3 copies as listed below shall be furnished along with the offer.

- a. Overall General arrangement drawing showing bushings arrangement with their clearance, terminal box, etc. as per design shown with front side and top views along with list of fittings, material and its composition, nos., make and electrical clearance and creep age distance etc.
- b. Drawing showing internal exposition of CT's and PT's inside tank with cross sectional view of CTs and PT, with dimensions, clearances, mounting arrangement details including details of electric and magnetic circuits.
- c. Diagram showing LT terminal arrangement with phase / polarity marking and clearances.
- d. Drawing of name plate showing details of CT and PT ratings, wiring diagram with terminal / polarity marking.

20.0 TESTING & INSPECTION:**20.1 QUALIFICATION:**

The tenderer shall have to furnish to following test certificates and documents.

- i. All type tests certificates as listed under Annexure-III for 11KV carried out on ONE single sample unit (For 11KV – 2 Single phase CTs having class of accuracy – 0.5S, 05 VA for CT and on three phase PT having Class of accuracy – 0.5, 30 VA for PT, and tests must not be carried out more than Three years prior to the date of submission of the tender offer. The above test should be carried out in any Govt. approved Test Lab as indicated above.
- ii. The tenderer shall also submit one type test certificate for the test of “Instrument Security Factor” as per the Cl. No. 7.1.2 of IS-2705 (Part-II) conducted on both phase of the CTs for the sample of 10/5 Amp. Of 11KV. The value of ISF must be 2.5 or less than 2.5 and the test must have been conducted at any Govt. Testing Lab not prior to more than 3 years from the date of submission of the offer.
- iii. The copy / proof of bill / invoice of purchase of core material.
- iv. The copy of BH curve for the core material intended to be used in regular supply of CTPT units.

If above test certificates are not submitted the offer will not be considered as “Qualified”.

NOTE: The technical offers of the suppliers submitted along with above Type Test Certificates for Three Phase two CTs combined CTPT unit (with all other technical specifications unchanged) conducted successfully on one single unit with all other rating and specification, i.e. STC, ISF etc. unchanged, will also be considered / accepted for evaluation purpose. However the successful / qualified tenderer shall have to prepare the prototype units as per tender's requirement and get tested for all tests (as per **DEPARTMENT OF POWER, ARUNACHAL PRADESH's** discretion) at any Govt. Test Lab prescribed by the **DEPARTMENT OF POWER, ARUNACHAL PRADESH** and preferably in the presence of **DEPARTMENT OF POWER's** officer, within a period on ONE month from the date of LOI, failing to which the order shall be liable to be cancelled without payment toward any compensation on account of cancellation of the order by the purchaser.

20.2 TYPE TEST CERTIFICATE:

On the strength of above qualification, LOI will be placed if offer passed in other requirements. However, before commencement of bulk supply, the supplier has to submit Test Certificates for all the Type Tests as prescribed under Annexure-III for 11KV CTPT sets with rations as specified under 16.1 above i.e. 10/5 Amp. for 11KV class of supply voltage.

All the tests as specified in Annexure-III shall have to be conducted only in the presence to the **DEPARTMENT OF POWER, ARUNACHAL PRADESH's** representative on ONE single Proto / sample unit.

The FINAL purchase order OR A/T shall be placed only after successful type testing on Proto units in the presence of **DEPARTMENT OF POWER, ARUNACHAL PRADESH** authority.

NOTE: The time limit for above test must be 30 days or whichever approved by **DEPARTMENT OF POWER, ARUNACHAL PRADESH**. Also in case even if the tenderer has not offered CTPT units of 10/5 Amp. 11KV class, the tenderer shall have to prepare lowest ratio (10/5 Amp. of 11KV) Proto CTPT unit and get their sample units tested at prescribed Govt. Testing Lab. The consent letter (if the lowest rating CTPT unit is not offered for bulk supply), shall be submitted along with the offer or otherwise the offer shall not be accepted.

The cost of all type testing and its related expenses shall have to be borne by supplier.

20.3 The **DEPARTMENT OF POWER, ARUNACHAL PRADESH** also reserves the right to carry out all or any type tests on any CTPT set from the lot offered for inspection by the firm at CPRI / ERDA or Govt. Recognized Lab. in presence of **DEPARTMENT OF POWER, ARUNACHAL PRADESH** officers and representative of firm at **DEPARTMENT OF POWER, ARUNACHAL PRADESH's** cost. Any decision based on this testing shall be applied to the full ordered quantity. However, if the unit fails in test, then the test charges shall have to be borne by the supplier.

20.4 ACCEPTANCE TESTS:

The tests shall be carried out at manufacturer's work as "**Acceptance Tests**" on all CTPT sets offered for inspections as per applicable is of individual units and this specification as per Annexure-IV.

20.5 ROUTINE TESTS:

The firm shall carry out the routine tests on each CTPT set being offered for inspection and submit the routine test certificate to the inspector deputed for inspection of CTPT sets and acceptance of the lot. Routine tests shall be carried out as per **Annexure-V**.

21.0 PROTO TYPE UNITS:

The successful tenderer shall have to prepare minimum 2 nos. of proto type units or ratio as specified under **Cl. No: TYPE TEST CERTIFICATE:** above, for 11KV separately conforming to this specification prior to manufacturing of bulk supply. The proto type units shall be subjected to (i) all Acceptance Tests as per clause no. **ACCEPTANCE TESTS:** of this specification at the firm's work and (ii) All type tests including the test of ISF on each CT, as per Annexure-III at any Govt. Testing Lab (the name of which shall be decided by **DEPARTMENT OF POWER, ARUNACHAL PRADESH**) in the presence of **DEPARTMENT OF POWER, ARUNACHAL PRADESH's** representative.

The testing fees shall have to be borne by the supplier.

NOTE: The TWO Nos. of lower / intended ratio CTPT – Proto Type units are required to be prepared only to continue testing work on second unit at either supplier's work or Govt. Testing Lab., whichever the case may be, in event of NOT passing through any Type test. However all Type Tests shall have to be conducted successfully on ONE single Proto unit.

The prototype units shall be sealed and kept at firm's premises. During subsequent inspection of CTPT set, any unit may be opened for comparison with prototype for internal design detail, if required. The prototype unit having passed all Type test / selected tests successfully shall be dispatched along with last lot only.

The detailed drawings as mentioned at clause no. **DRAWINGS:** of this tender specifications be submitted by the firm along with offer and only after approval of prototype unit and detailed drawings, the firm shall start bulk supply conforming to approved proto type units.

The prototype units shall be dispatched along with last lot only.

22.0 GUARANTEE:

The combined CTPT set offered shall have guarantee for good design, materials and workmanship. The defective units shall have to be repaired / replaced free of cost if reported **66** months of their receipt at site or **60** months from the date of commissioning of equipments whichever is earlier.

The firm shall be responsible for proper performance of the equipment for 66 months of their receipt at site or 60 months after commissioning whichever is earlier.

Reported failed units under guarantee period as above shall be repaired / replaced as early as possible. In any case, it should be repaired / replaced within 30 days. The failed units are to be collected by the supplier from our field offices within 15 days of reporting. If immediate arrangement for collection of failed unit is not collected and if the units are not repaired within two months time, the **DEPARTMENT OF POWER, ARUNACHAL PRADESH** will deduct full cost of CTPT unit from the bill. All the suppliers have to give 10% Performance Bank Guarantee in advance as security deposit.

**TECHNICAL SPECIFICATION FOR CONSUMER METERING PANEL TO HOUSE 4 NOS.
LT SINGLE/THREE PHASE PRE-PAID/3 PHASE 4 WIRE LT CT OPERATED AMR METER**

1.0 SCOPE:

The scope of technical specification covers the design, engineering, manufacture, assembly, inspection, testing, packing, supply and delivery at site of outdoor type floor mounted consumer metering panel of appropriate dimensions. The panel board shall be provided with hinged type double doors and locking arrangements with compatibility for fixing of 4 Nos. LT Single/Three Phase Pre-Paid/Three Phase Four Wire LT CT operated AMR meter of **SECURE/L&T/GENUS** or equivalent standard manufacturer and embossing of Department Logo with inscription of "**Department of Power, Arunachal Pradesh**" on the top front door.

2.0 GENERAL SPECIFICATIONS:

- 2.1 The Panel Board shall be outdoor, self supporting, cubical type, dust and vermin proof.
- 2.2 Degree of protection shall be IS IP-54
- 2.3 The Panel Board shall be fabricated out of 14 SWG 2 mm C.R.C.A sheet.
- 2.4 Name plates for consumer including bulbs & switches shall be provided.
- 2.5 The panel shall be 9 (Nine) tank chemical pretreated and then powder coated with pure polyester type paint of Siemens Grey colour/appropriate colour or higher grade of manufacturing technology.
- 2.6 Ventilation louvers with wire mesh shall be provided.
- 2.7 General arrangement diagram of metering panel indicating front view (with door removed), front view (with outside door), side view and bottom view should be provided.
- 2.8 Single line diagram of metering panel indicating meter connection shall be provided.
- 2.9 Panel depth shall be mentioned as per the requirement.
- 2.10 All dimensions should be in mm.
- 2.11 Appropriate angle size of frame should be indicated.
- 2.12 The appropriate angle size of the indicating meters should be indicated.
- 2.13 The class of accuracy for indicating meters should be indicated.
- 2.14 The size of the Panel Board should be mention in H x W x D.
- 2.15 Appropriate rating in Ampere and cross section in mm of Aluminium Bus-bar should be mentioned.
- 2.16 The rating of the main switch of the Panel, individual consumer switch and display meters should be given.
- 2.17 Number of Energy Meters shall be 4 Nos. LT Single/Three Phase Pre-Paid/Three Phase Four Wire LT CT operated AMR Meter.

TECHNICAL SPECIFICATION FOR CONSUMER METERING PANEL TO HOUSE 8 NOS. LT SINGLE/THREE PHASE PRE-PAID/3 PHASE 4 WIRE LT CT OPERATED AMR METER

1.0 SCOPE:

The scope of technical specification covers the design, engineering, manufacture, assembly, inspection, testing, packing, supply and delivery at site of outdoor type floor mounted consumer metering panel of appropriate dimensions. The panel board shall be provided with hinged type double doors and locking arrangements with compatibility for fixing of 8 Nos. LT Single/Three Phase Pre-Paid/Three Phase Four Wire LT CT operated AMR meter of **SECURE/L&T/GENUS** or equivalent standard manufacturer and embossing of Department Logo with inscription of "**Department of Power, Arunachal Pradesh**" on the top front door.

2.0 GENERAL SPECIFICATIONS:

- 2.1 The Panel Board shall be outdoor, self supporting, cubical type, dust and vermin proof.
- 2.2 Degree of protection shall be IS IP-54
- 2.3 The Panel Board shall be fabricated out of 14 SWG 2 mm C.R.C.A sheet.
- 2.4 Name plates for consumer including bulbs & switches shall be provided.
- 2.5 The panel shall be 9 (Nine) tank chemical pretreated and then powder coated with pure polyester type paint of Siemens Grey colour/appropriate colour or higher grade of manufacturing technology.
- 2.6 Ventilation louvers with wire mesh shall be provided.
- 2.7 General arrangement diagram of metering panel indicating front view (with door removed), front view (with outside door), side view and bottom view should be provided.
- 2.8 Single line diagram of metering panel indicating meter connection shall be provided.
- 2.9 Panel depth shall be mentioned as per the requirement.
- 2.10 All dimensions should be in mm.
- 2.11 Appropriate angle size of frame should be indicated.
- 2.12 The appropriate angle size of the indicating meters should be indicated.
- 2.13 The class of accuracy for indicating meters should be indicated.
- 2.14 The size of the Panel Board should be mention in H x W x D.
- 2.15 Appropriate rating in Ampere and cross section in mm of Aluminium Bus-bar should be mentioned.
- 2.16 The rating of the main switch of the Panel, individual consumer switch and display meters should be given.
- 2.17 Number of Energy Meters shall be 8 Nos. LT Single/Three Phase Pre-Paid/Three Phase Four Wire LT CT operated AMR Meter.

**TECHNICAL SPECIFICATION FOR CONSUMER METERING PANEL TO
HOUSE 12 NOS. LT SINGLE/THREE PHASE PRE-PAID ENERGY METER**

1.0 SCOPE:

The scope of technical specification covers the design, engineering, manufacture, assembly, inspection, testing, packing, supply and delivery at site of outdoor type floor mounted consumer metering panel of appropriate dimensions. The panel board shall be provided with hinged type double doors and locking arrangements with compatibility for fixing of 12 Nos. LT Single/Three Phase Pre-Paid energy meter of **SECURE/L&T/GENUS** or equivalent standard manufacturer and embossing of Department Logo with inscription of "**Department of Power, Arunachal Pradesh**" on the top front door.

2.0 GENERAL SPECIFICATIONS:

- 2.1 The Panel Board shall be outdoor, self supporting, cubical type, dust and vermin proof.
- 2.2 Degree of protection shall be IS IP-54
- 2.3 The Panel Board shall be fabricated out of 14 SWG 2 mm C.R.C.A sheet.
- 2.4 Name plates for consumer including bulbs & switches shall be provided.
- 2.5 The panel shall be 9 (Nine) tank chemical pretreated and then powder coated with pure polyester type paint of Siemens Grey colour/appropriate colour or higher grade of manufacturing technology.
- 2.6 Ventilation louvers with wire mesh shall be provided.
- 2.7 General arrangement diagram of metering panel indicating front view (with door removed), front view (with outside door), side view and bottom view should be provided.
- 2.8 Single line diagram of metering panel indicating meter connection shall be provided.
- 2.9 Panel depth shall be mentioned as per the requirement.
- 2.10 All dimensions should be in mm.
- 2.11 Appropriate angle size of frame should be indicated.
- 2.12 The appropriate angle size of the indicating meters should be indicated.
- 2.13 The class of accuracy for indicating meters should be indicated.
- 2.14 The size of the Panel Board should be mention in H x W x D.
- 2.15 Appropriate rating in Ampere and cross section in mm of Aluminium Bus-bar should be mentioned.
- 2.16 The rating of the main switch of the Panel, individual consumer switch and display meters should be given.
- 2.17 Number of Energy Meters shall be 12 Nos. LT Single/Three Phase Pre-Paid Energy Meter.

**TECHNICAL SPECIFICATION FOR CONSUMER METERING PANEL TO
HOUSE 16 NOS. LT SINGLE/THREE PHASE PRE-PAID ENERGY METER**

1.0 SCOPE:

The scope of technical specification covers the design, engineering, manufacture, assembly, inspection, testing, packing, supply and delivery at site of outdoor type floor mounted consumer metering panel of appropriate dimensions. The panel board shall be provided with hinged type double doors and locking arrangements with compatibility for fixing of 16 Nos. LT Single/Three Phase Pre-Paid energy meter of **SECURE/L&T/GENUS** or equivalent standard manufacturer and embossing of Department Logo with inscription of "**Department of Power, Arunachal Pradesh**" on the top front door.

2.0 GENERAL SPECIFICATIONS:

- 2.1 The Panel Board shall be outdoor, self supporting, cubical type, dust and vermin proof.
- 2.2 Degree of protection shall be IS IP-54
- 2.3 The Panel Board shall be fabricated out of 14 SWG 2 mm C.R.C.A sheet.
- 2.4 Name plates for consumer including bulbs & switches shall be provided.
- 2.5 The panel shall be 9 (Nine) tank chemical pretreated and then powder coated with pure polyester type paint of Siemens Grey colour/appropriate colour or higher grade of manufacturing technology.
- 2.6 Ventilation louvers with wire mesh shall be provided.
- 2.7 General arrangement diagram of metering panel indicating front view (with door removed), front view (with outside door), side view and bottom view should be provided.
- 2.8 Single line diagram of metering panel indicating meter connection shall be provided.
- 2.9 Panel depth shall be mentioned as per the requirement.
- 2.10 All dimensions should be in mm.
- 2.11 Appropriate angle size of frame should be indicated.
- 2.12 The appropriate angle size of the indicating meters should be indicated.
- 2.13 The class of accuracy for indicating meters should be indicated.
- 2.14 The size of the Panel Board should be mention in H x W x D.
- 2.15 Appropriate rating in Ampere and cross section in mm of Aluminium Bus-bar should be mentioned.
- 2.16 The rating of the main switch of the Panel, individual consumer switch and display meters should be given.
- 2.17 Number of Energy Meters shall be 16 Nos. LT Single/Three Phase Pre-Paid Energy Meter.

**TECHNICAL SPECIFICATION FOR CONSUMER METERING PANEL TO
HOUSE 20 NOS. LT SINGLE/THREE PHASE PRE-PAID ENERGY METER**

1.0 SCOPE:

The scope of technical specification covers the design, engineering, manufacture, assembly, inspection, testing, packing, supply and delivery at site of outdoor type floor mounted consumer metering panel of appropriate dimensions. The panel board shall be provided with hinged type double doors and locking arrangements with compatibility for fixing of 20 Nos. LT Single/Three Phase Pre-Paid energy meter of **SECURE/L&T/GENUS** or equivalent standard manufacturer and embossing of Department Logo with inscription of "**Department of Power, Arunachal Pradesh**" on the top front door.

2.0 GENERAL SPECIFICATIONS:

- 2.1 The Panel Board shall be outdoor, self supporting, cubical type, dust and vermin proof.
- 2.2 Degree of protection shall be IS IP-54
- 2.3 The Panel Board shall be fabricated out of 14 SWG 2 mm C.R.C.A sheet.
- 2.4 Name plates for consumer including bulbs & switches shall be provided.
- 2.5 The panel shall be 9 (Nine) tank chemical pretreated and then powder coated with pure polyester type paint of Siemens Grey colour/appropriate colour or higher grade of manufacturing technology.
- 2.6 Ventilation louvers with wire mesh shall be provided.
- 2.7 General arrangement diagram of metering panel indicating front view (with door removed), front view (with outside door), side view and bottom view should be provided.
- 2.8 Single line diagram of metering panel indicating meter connection shall be provided.
- 2.9 Panel depth shall be mentioned as per the requirement.
- 2.10 All dimensions should be in mm.
- 2.11 Appropriate angle size of frame should be indicated.
- 2.12 The appropriate angle size of the indicating meters should be indicated.
- 2.13 The class of accuracy for indicating meters should be indicated.
- 2.14 The size of the Panel Board should be mention in H x W x D.
- 2.15 Appropriate rating in Ampere and cross section in mm of Aluminium Bus-bar should be mentioned.
- 2.16 The rating of the main switch of the Panel, individual consumer switch and display meters should be given.
- 2.17 Number of Energy Meters shall be 20 Nos. LT Single/Three Phase Pre-Paid Energy Meter.
