Technical Specification

FOR

3Ph 4 WIRE LT CT & 3Ph 3/4 WIRE HT CT/PT OPERATED FULLY STATIC

AMR COMPATIBLE TRI-VECTOR ENERGY METERS

DLMS COMPLIANT – CATEGORY 'C1'

FOR

1) 240 V, LT CT OPERATED METER (*3Ph 4 Wire*)

2) 11KV BULK CONSUMER METER (*3Ph 3 Wire*)

3) 33 KV BULK CONSUMER METER (*3Ph 4 Wire*)

TECHNICAL SPECIFCATION FOR 3PHASE 4 WIRE LT CT, 3PHASE 3 WIRE CT/PT & 3PHASE 4 WIRE CT/PT OPERATED FULLY STATIC AMR COMPATIBLE TRI-VECTOR ENERGY METERS FOR BULK CONSUMER

1.0 SCOPE

Design, manufacturing, testing, supply and delivery of

1. AC, 3 Phase, 4 Wire, CT/PT operated fully Static and AMR compatible Tri-Vector Energy Meters
2. AC, 3 Phase, 3 Wire, CT/PT operated fully Static and AMR compatible Tri-Vector Energy Meters
3. AC, 3 Phase,4wire LT CT operated fully Static and AMR compatible Tri-Vector Energy Meters

   for measurement of different electrical parameters listed elsewhere in the document including
   1. Active Energy
      a. kWh for LT meters
      b. MWh for 11 kV & 33 kV meters
   2. Reactive Energy (kVArh/ MVArh),
      a. kVArh for LT meters
      b. MVArh for 11 kV & 33 kV meters
   3. Apparent Energy etc.
      a. kVAh for LT meters
      b. MVAh for 11 kV & 33 kV meters

2.0 APPLICATION

CONSUMER METER – **Category "C1" for only DLMS meters**

3.0 STANDARDS TO WHICH METERS SHALL COMPLY

IS-14697:1999(2004) Specification for AC Static Transformer operated Watt Hour & VAR-Hour meters (class 0.5S);

IS-15959:2011 Data Exchange for Electricity Meter Reading Tariff & Load Control – Companion Specification

CBIP - 325 Manual on Standardization of AC Static Electrical Energy Meter

IEC 62052-11 Electricity metering equipment (AC) –General requirements, tests and test conditions -Part 11: Metering equipment;

IEC 62053-22 Electricity metering equipment (AC) –Particular requirements - Part-22: Static Meters for Active Energy (Class 0.5S);

IEC 62053-23 Electricity metering equipment (AC) –Particular requirements - Part-23: Static Meters for Reactive Energy;

IS 15707 Specification for Testing, evaluation, installation & maintenance of AC Electricity Meters-Code of Practice.

Guidelines on "Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification"

IEC 62056-21 Electricity metering: Data exchange for meter reading, tariff and load control- Part 21: Direct local data exchange

IEC 62056-31 Electricity metering: Data exchange for meter reading, tariff and load control -Part 31: Local Area Network data exchange

IEC 62056-61 Electricity metering: Data exchange for meter reading, tariff and load control- Part 61: Object identification system (OBIS)

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 the Guidelines on "Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification" enclosed with this document as annexure shall prevail upon.

4.0 GENERAL TECHNICAL REQUIREMENTS

1	TYPE	*AMR Compatible Static, Tri-Vector Energy Meter for Bulk Consumers .* i) 3Ph,3Wire 11kV ,50/5A CT/PT operated Tri-vector meter ii) 3Ph,4Wire 33V, 100/1A CT/PT operated Tri-vector Meter iii) 3Ph,4Wire 240V , 200/5A,(LTCT) Tri-Vector Energy Meter
2	FREQUENCY	50 Hz ± 5%
3	ACCURACY CLASS	0.5S

4	VOLTAGE RATING	Suitable for operation from
		i) 11kV /110 V (3P, 3W)
		      PT secondary 110V ph-ph: 63.5 V ph-N
		ii) 33/$\sqrt{3}$kV /110/$\sqrt{3}$ V (3P, 4W)
		      PT secondary 110 V ph-ph: 63.5 V ph-N
		iii) 240V Ph-N, 240 V LT CT (3P, 4W)

	VOLTAGE VARIATION	(-) 30% to (+) 20%
5	BASIC CURRENT (I_b) & CURRENT RATING	i) I_b- 5A, Ratio : 50/5 A) for 11 kV CT (3P-3W) ii) I_b - 1A, Ratio : 100/1 A) for 33 kV CT (3P, 4W iii) I_b - 5A, Ratio : 200/5 A for LT CT(3P, 4W)
6	MAXIMUM CONTINUOUS CURRENT	As per IS 14697:1999(2004)
	STARTING CURRENT	0.1% of I_b at UPF
7	POWER CONSUMPTION	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. 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 Lag – Unity – 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	**DLMS TEST CERTIFICATE**	Manufacturer must have test certificate for conformance to DLMS from CPRI of Category – C1.
		  i) 3Ph,3Wire 11kV ,50/5A CT/PT operated meter – **DLMS Test Certificate not applicable**
		  ii) 3Ph,4Wire 33 kV, 100/1A CT/PT operated Tri-vector Meter DLMS Test Certificate mandatory for manufacturer
		  iii) 3Ph,4Wire 240V , 200/1A,(LTCT) Tri-Vector Energy Meter DLMS Test Certificate mandatory for manufacturer

5.0 TEMPARATURE RISE:

Under normal condition of use, winding and insulation shall not reach a temperature, which might adversely affect the operation of the meters. IS14697:1999(2004) should be followed.

6.0 CLIMATIC CONDITIONS:

Temperature   :   -10° C to 55° C (in shade)

Humidity   :   up to 95% RH non-condensing

Average annual rainfall   :   150 cm.

Max Wind Pressure   :   150 kg/sq.m.

Max. altitude above MSL   :   3000 m.

7.0 TROPICAL TREATMENT:

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

8.0 CONSTRUCTIONAL REQUIREMENT/ METER COVER & SEALING ARRANGEMENT

Wherever poly carbonate cover is specified, it shall conform to IS 11731 (FH-1category) besides meeting the test requirement of heat deflection test as per ISO 75, glow wire test as per the IS:11000 (part 2/SEC-1) 1984 OR IEC PUB,60695-2-12, Ball pressure test as per IEC--60695-10-2 and Flammability Test As per UL 94 or As per IS 11731(Part-2) 1986.

9.0 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 should be non-hygroscopic, non-ageing & have tested quality.

The meter should comply latest technology such as **Microcontroller 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/ High grade Engineering plastic/Thermosetting Plastic casing of projection mounting type. **The meter cover should be transparent,** for easy reading of displayed parameters, and observation of operation indicators. The meter base may or may not be transparent, **but it should not be black in colour**. The meter casing should not change shape, size, and dimensions when subjected to 200 hrs on UV test as per ASTMD 53. It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75.

Meters must be supplied with 2 (two) nos. manufacturers' seals between meter base and meter cover at both the sides.

Both the communication port (Optical and RS232 port) should have proper sealing arrangement.

The bidder shall submit relevant documents regarding the procurement of polycarbonate material. The polycarbonate material of only the following manufacturers shall be used.

a)   G.E. Plastics/Sabic: LEXAN 943A or LEXAN 143 or equivalent for Meter & Terminal cover, and LEXAN 503R or 500R or equivalent for base

b)   BAYER/SABIC :   Grade corresponding to above

c)   DOW Chemicals :   -Do-

d)   MITSUBISHI :   -Do-

e)   TEJIN :   -Do-

f)   DUPONT :   -Do-

10.0   METER CASE AND COVER

The meter should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover. This is to be achieved by use of **Ultrasonic Welding** (Ultrasonically continuously welded at three sides so that the cover cannot be separated from the base without breaking/damaging the case and cover) i.e. break to open type**.** In case, ultrasonic welding using plate/strip is used the material of plate/strip should be same as that of cover and base and the strip should **flush with meter body.** The manufacturer's logo should be embossed on the strip / plate.

The meter cover should be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No. 325.

11.0 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 nickel plated brass inserts / alloy 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 M 4 and head having 4-6mm. 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 internal diameter of terminal hole should be minimum 5.5 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 High grade Engineering Plastic/Polycarbonate/ Thermosetting 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 terminal cover should preferably be detachable.** The space inside the terminal cover should be sufficient to accommodate adequate length of external cables.

12.0 WORKING ENVIRONMENT

As per IS 14697:1999(2004). Meter to perform satisfactorily under Non-Air Conditioned environment (within stipulations of IS) IP51 housing for indoors.

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.

13.0 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' 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. 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 (Ib) 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.

14.0   DISPLAY OF MEASURED VALUES

The meter shall have Alphanumeric display with at least **7 full digit** with LCD backlit display, having minimum character height of 10 mm. The meter display shall have **7 digits**(complete) for energy counter with alphanumeric digits for parameter identifier and tamper indication with backlit Liquid Crystal Display (LCD) of minimum 10 mm height, wide viewing angle suitable for temperature withstand of 70° C. LCD to be of 'STN' (super twisted numeric) type construction.

The data stored in the meters shall not be lost in the event of power failure. The meter shall have Non Volatile Memory (NVM), which does not need any battery backup. The NVM shall have a minimum retention period of 10 years.

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

Auto display cycling of each parameter should be minimum 10-12 Seconds. The time between two auto display cycles shall be 100-120 sec. OBIS code in display is optional.

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

For 33 kV meters (3Phase 4 Wire)

AUTO MODE:

    i.   *LCD Test*
    ii.   *Meter Sl no.*
    iii.   *Real Time & Date (DD/MM/YYYY)*
    iv.   *Rising Apparent Demand with elapsed time*
    v.   *Cumulative Power Off Hours*
    vi.   *Inst. Primary Voltages –Phase Wise (Ph- N for 3-Ph,4-Wire)*
    vii.   *Inst. Primary Currents – Phase Wise*
    viii.   *Cumulative Total Active Energy (5+2) (cumulative sign /legend must be given)*
    ix.   *Cumulative Total Reactive Energy Lag (5+2)*
    x.   *Cumulative Total Reactive Energy Lead (5+2)*
    xi.   *Cumulative Apparent Energy (5+2) – Lag Only*
    xii.   *Apparent Max. Demand (4+3) – Lag Only*
    xiii.   *TOD Wise Total Active Energies*
    xiv.   *TOD Wise Apparent Energies*
    xv.   *TOD Wise Apparent Max. Demand (MD)*
    xvi.   *History 1 Cumulative Active Forward Energy(5+2)*
    xvii.   *History 1TOD Wise Cumulative Active Forward Energy(5+2)*
    xviii.   *History 1 Cumulative Apparent Forward Energy(5+2)*
    xix.   *History 1 TOD Wise Cumulative Apparent Forward Energy(5+2)*
    xx.   *History 1 Apparent maximum Demand(4+3)*
    xxi.   *History 1 TOD Wise Apparent maximum Demand(4+3)*
    xxii.   *Cumulative Apparent Maximum Demand (cumulative sign /legend must be given)*
    xxiii.   *Connection Check*
    xxiv.   *Self Diagnosis*
    xxv.   *Phase Sequence & phase correspondences of voltage and current*
    xxvi.   *Cumulative Billing Count*
    xxvii.   *Cumulative Tamper Count*

PUSH BUTTON MODE :

    (i) to (xxvii) of Auto Display and then
    xxviii) Cumulative Programming Count
    xxix)   Last Billing Date & Time
    xxx)   Signed Inst. Power Factor – Phase Wise
    xxxi)   Instantaneous Net Phase Power Factor
    xxxii)   History 1 Billed Average Power Factor
    xxxiii)   Signed Inst. Active Power,
    xxxiv)   Inst. Apparent Power
    xxxv)   Supply Frequency
    xxxvi)   Present Tamper Status (PT/CT/Other)
    xxxvii)   First Tamper Occurrence with Date & Time
    xxxviii)   Last Tamper Occurrence with Date & Time
    xxxix)   Last Tamper Restoration with Date & Time
    xl)   Front Cover Open Count
    xli)   Front Cover Open Indication with Date & Time

xlii)   *High Resolution Cumulative Active Forward Energy(**2+5**)*
xliii)   *High Resolution Cumulative Reactive Forward Energy(lag) (**2+5**)*
xliv)   *High Resolution Cumulative Reactive Forward Energy(lead) (**2+5**)*
xlv)   *High Resolution Cumulative Apparent Forward Energy(**2+5**)*
xlvi)   *Battery Status*

Power Off Display

      i.   *Meter Sl no.*
     ii.   *Real Time & Date (DD/MM/YYYY)*
    iii.   *Cumulative Power Off Hours*
    iv.   *Cumulative Total Active Energy (5+2) (cumulative sign /legend must be given)*
     v.   *Cumulative Total Apparent Energy (5+2) – Lag Only*
    vi.   *Apparent Max. Demand (4+3) – Lag Only*
   vii.   *History 1 Cumulative Active Forward Energy(5+2)*
  viii.   *History 1TOD Wise Cumulative Active Forward Energy(5+2)*
    ix.   *History 1 Cumulative Apparent Forward Energy(5+2)*
     x.   *History 1 TOD Wise Cumulative Apparent Forward Energy(5+2)*
    xi.   *History 1 Apparent maximum Demand(4+3)*
   xii.   *History 1 TOD Wise Apparent maximum Demand(4+3)*
  xiii.   *Cumulative Apparent Maximum Demand (cumulative sign /legend must be given)*

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.

For 11 kV meters (3Phase 3 Wire)
AUTO MODE:

     i.   *LCD Test*
    ii.   *Meter Sl no.*
   iii.   *Real Time & Date (DD/MM/YYYY)*
   iv.   *Rising Apparent Demand with elapsed time*
    v.   *Cumulative Power Off Hours*
   vi.   *Inst. Primary Voltages –Phase Wise (Ph- Ph for 3-Ph 3Wire)*
   vii.   *Inst. Primary Currents – Phase Wise*
  viii.   *Cumulative Total Active Energy (5+2) (cumulative sign /legend must be given)*
   ix.   *Cumulative Total Reactive Energy Lag (5+2)*
    x.   *Cumulative Total Reactive Energy Lead (5+2)*
   xi.   *Cumulative Total Apparent Energy (5+2) – Lag Only*
   xii.   *Apparent Max. Demand (4+3) – Lag Only*
  xiii.   *TOD Wise Total Active Energies*
  xiv.   *TOD Wise Apparent Energies*
   xv.   *TOD Wise Apparent Max. Demand (MD)*
  xvi.   *History 1 Cumulative Active Forward Energy(5+2)*
  xvii.   *History 1TOD Wise Cumulative Active Forward Energy(5+2)*
 xviii.   *History 1 Cumulative Apparent Forward Energy(5+2)*
  xix.   *History 1 TOD Wise Cumulative Apparent Forward Energy(5+2)*
   xx.   *History 1 Apparent maximum Demand(4+3)*
  xxi.   *History 1 TOD Wise Apparent maximum Demand(4+3)*
  xxii.   *Cumulative Apparent Maximum Demand (cumulative sign /legend must be given)*
 xxiii.   *Connection Check*
 xxiv.   *Self Diagnosis*
  xxv.   *Phase Sequence & phase correspondences of voltage and current*
 xxvi.   *Cumulative Billing Count*
xxvii.   *Cumulative Tamper Count*

PUSH BUTTON MODE :

    (i) to (xxvii) of Auto Display and then
 xxviii.   *Cumulative Programming Count*
  xxix.   *Last Billing Date & Time*
   xxx.   *Signed Inst. Power Factor – Phase Wise*
  xxxi.   *Instantaneous Net Phase Power Factor*
  xxxii.   *History 1 Billed Average Power Factor*
 xxxiii.   *Signed Inst. Active Power,*
 xxxiv.   *Inst. Apparent Power*
  xxxv.   *Supply Frequency*
 xxxvi.   *Present Tamper Status (PT/CT/Other)*
 xxxvii.   *First Tamper Occurrence with Date & Time*
xxxviii.   *Last Tamper Occurrence with Date & Time*
 xxxix.   *Last Tamper Restoration with Date & Time*
   xl.   *Front Cover Open Count*
  xli.   *Front Cover Open Indication with Date & Time*

xlii. *High Resolution Cumulative Active Forward Energy(**2+5**)*

xliii. *High Resolution Cumulative Reactive Forward Energy(lag) (**2+5**)*

xliv. *High Resolution Cumulative Reactive Forward Energy(lead) (**2+5**)*

xlv. *High Resolution Cumulative Apparent Forward Energy(**2+5**)*

xlvi. *Battery Status*

Power Off Display

i. *Meter Sl no.*

ii. *Real Time & Date (DD/MM/YYYY)*

iii. *Cumulative Power Off Hours*

iv. *Cumulative Total Active Energy (5+2) (cumulative sign /legend must be given)*

v. *Cumulative Total Apparent Energy (5+2) – Lag Only*

vi. *Apparent Max. Demand (4+3) – Lag Only*

vii. *History 1 Cumulative Active Forward Energy(5+2)*

viii. *History 1TOD Wise Cumulative Active Forward Energy(5+2)*

ix. *History 1 Cumulative Apparent Forward Energy(5+2)*

x. *History 1 TOD Wise Cumulative Apparent Forward Energy(5+2)*

xi. *History 1 Apparent maximum Demand(4+3)*

xii. *History 1 TOD Wise Apparent maximum Demand(4+3)*

xiii. *Cumulative Apparent Maximum Demand (cumulative sign /legend must be given)*

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.

For LT meters (3Phase 4 Wire)

AUTO MODE:

    i)   *LCD Test*
    ii)   *Meter Sl. no.*
    iii)   *Real Time & Date (DD/MM/YYYY)*
    iv)   *Rising Apparent Demand with elapsed time*
    v)   *Cumulative Power Off in Hours*
    vi)   *Inst. Voltages –Phase Wise (Ph- N for 3-Ph,4-Wire)*
    vii)   *Inst. Primary Currents – Phase Wise*
    viii)   *Cumulative Active Forward Energy*
    ix)   *Reactive Lag Forward Energy Register*
    x)   *Reactive Lead Forward Energy Register*
    xi)   *Total Apparent Forward Energy Register*
    xii)   *Apparent Forward MD Register (00-24hrs)*
    xiii)   *TOD Wise Total Active Energies*
    xiv)   *TOD Wise Apparent Energies*
    xv)   *TOD Wise Apparent Max. Demand (MD)*
    xvi)   *History1 Cumulative Total Active Energy (7 full digit) (cumulative sign /legend must be given)*
    xvii)   *History1 TOD Wise Total Active Energies*
    xviii)   *History1 Cumulative Apparent Energy (7 full digit) – Lag Only*
    xix)   *History1 TOD Wise Apparent Max. Demand (MD)*
    xx)   *History1 Apparent Max. Demand (4+3) – Lag Only(00-24hrs)*
    xxi)   *History1 TOD Wise Apparent Energies*
    xxii)   *Cumulative Apparent Maximum Demand (cumulative sign /legend must be given)*
    xxiii)   *Connection Check*
    xxiv)   *Self Diagnosis*
    xxv)   *Phase Sequence & phase correspondences of voltage and current*
    xxvi)   *Cumulative Billing Count*
    xxvii)   *Cumulative Tamper Count*

PUSH BUTTON MODE :

(i) to (xxvii) of Auto Display and then
xxviii)   *Cumulative Programming Count*
xxix)   *Apparent Forward MD Register (00-24hrs)*
xxx)   *TOD wise Cumulative Active Forward Energy*
xxxi)   *TOD wise   Cumulative Apparent Forward Energy*
xxxii)   *TOD wise   Apparent Forward MD Register*
xxxiii)   *Apparent Forward Cumulative MD Register*
xxxiv)   *Phase Sequence & phase correspondences of voltage and current*
xxxv)   *Last MD Reset Date & Time*
xxxvi)   *Signed Inst. Power Factor – Phase Wise*
xxxvii)   *Instantaneous Average Factor*
xxxviii) *History 1 Billed Average Power Factor*
xxxix)   *Signed Inst. Active Power,*
xl)   *Inst. Apparent Power*
xli)   *Supply Frequency*
xlii)   *Present Tamper Status (Voltage related/Current related/Other)*

xliii)   First Tamper Occurrence with Date & Time
xliv)   Last Tamper Occurrence with Date & Time
xlv)   Last Tamper Restoration with Date & Time
xlvi)   Front Cover Open Count
xlvii)   Front Cover Open Indication with Date & Time
xlviii) High Resolution Cumulative Active Forward Energy(Minimum 2+4)
xlix)   High Resolution Cumulative Reactive Forward Energy(lag) (Minimum 2+4)
l)   High Resolution Cumulative Reactive Forward Energy(lead) (Minimum 2+4)
li)   High Resolution Cumulative Apparent Forward Energy(Minimum 2+4)
lii)   Battery Status

Power Off Display

i.   Meter Sl no.
ii.   Real Time & Date (DD/MM/YYYY)
iii.   Cumulative Power Off Hours
iv.   Cumulative Total Active Energy (5+2) (cumulative sign /legend must be given)
v.   Cumulative Total Apparent Energy (5+2) – Lag Only
vi.   Apparent Max. Demand (4+3) – Lag Only
vii.   History 1 Cumulative Active Forward Energy(5+2)
viii.   History 1TOD Wise Cumulative Active Forward Energy(5+2)
ix.   History 1 Cumulative Apparent Forward Energy(5+2)
x.   History 1 TOD Wise Cumulative Apparent Forward Energy(5+2)
xi.   History 1 Apparent maximum Demand(4+3)
xii.   History 1 TOD Wise Apparent maximum Demand(4+3)
xiii.   Cumulative Apparent Maximum Demand (cumulative sign /legend must be given)

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.

Push button mechanism should be of high quality and should provide trouble free service for a long span of time. Up and Down scrolling facility should be there for Push Button Mode.

15.0   MAXIMUM DEMAND

The meter should be capable of recording the Apparent and Active MD with integration period of 15 minutes (programmable).

MD RESET OPTION

i) Billing Date at 00:00 Hrs (Programmable) on 1st day of the month.

ii) Push button

iii) **By Authenticated Command from BCS through HHU or directly from PC and REMOTE Communication.**

MD reset button should have proper sealing arrangement. Specific operation should be available in downloading data.

16.0 PERFORMANCE UNDER INFLUENCE QUANTITIES

The meters performance under influence quantities shall be governed by IS 14697:1999 (2004). The accuracy of meter shall not exceed the permissible limits of accuracy as per standard IS 14697:1999(2004)

17.0 OUTPUT DEVICE

Energy Meter shall have test output, accessible from the front, and be capable of being monitored with suitable testing equipment while in operation at site. The operation indicator must be visible from the front and test output device shall be provided in the form of LED. Resolution of the test output device shall be sufficient to enable the starting current test in less than 10 minutes. Minimum gap should be maintained between Active & Reactive Test LED.

18.0 REAL TIME INTERNAL CLOCK (RTC)

RTC shall be pre-programmed for 30 Years Day and date without any necessity for correction. The maximum drift shall not exceed ± 300 Seconds per year. Meter may be lying in power off condition for two years (less than 730 days) from date of supply but RTC should not drift more than ± 300 seconds.

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

a) **Hand Held Unit (HHU) or directly through BCS and this shall authentication from BCS for individual meter**.

b) From remote server through suitable communication network with authentication from BCS.

19.0   TIME OF DAY FACILITIES:

The meter should have facilities to record Active, Apparent Energies and MD with a facility of **8 time zones. The time zones should be user programmable through authenticated command from BCS with the help of HHU.**

20.0   METER READING DURING POWER OFF:

It should be possible to read the meter-display visually and with MRI and in absence of input voltages with the help of internal battery for display in power off condition or external battery pack/PPU. The interface should be inductive coupling. **If internal battery is used then it shall be capable of supplying the required power for at least two years under meter unpowered condition. Bidders' must mention the consumption of battery(in mA) (in the submitted documents) during power off display and data downloading process in power off condition and this will be checked during sample meter testing.**

21.0 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. If possible, the details of malfunctioning should be recorded in the meter memory. **The bidder should furnish the details of self-diagnostic capability feature, viz (i) Memory status, (ii) Battery status (iii) NVM Status and it should be available in display as well as BCS end data..**

22.0 BASE COMPUTER SOFTWARE (BCS):

The BCS should be compatible **Windows 7(both 32 bit and 64 bit), Windows 8(64 bit), & Windows 10** operating systems and copy righted. The data stored in the meters memory including defrauded energy should be available on the BCS. **Only one BCS should be provided for downloading data and programming of meter from CMRI and Laptop**.

Before performing and transaction through authenticated CMRI or Laptop the software should be programmed **so as to take full meter reading as back up and the said data must be available at BCS end**.

The data transfer should be reliable and fraud proof. BCS should give all details pertaining to billing and load survey data. The meter condition details should also be transferred into the BCS including abnormalities/anomalies of voltage current conditions or tamper conditions which can occur due to mistake in connections or intentionally done for the purpose of tamper.

The software should show electrical conditions existing at the time of reading the meter in tabular forms as well as in graphical format (Phasor diagram).

All the information about energy, maximum demand and their respective TOD register readings, billing register readings and billing history readings should be shown in a manner which user can understand quickly, preferably in tabular format.

All the load survey data should be available in numerical as well as graphical format. It should also be possible to view this data in daily, weekly and monthly formats. The load survey graph should show values.

All the information about tamper events should be accompanied with date and time stamping along with the 'SNAPSHOT' (details) of the respective electrical conditions. This information should be displayed in the sequence in which it happened, in cumulative format as well as in summary format. The cumulative format should segregate a particular tamper information and summary report should show count of tamper occurrence, restoration and the duration for which meter has remained under tamper condition.

In BCS, tamper events must be followed as per Table 32-38 as per Annexure-G. In display, first tamper occurrence & last tamper occurrence & restoration with date & time and total tamper count must be available.

 Facility to view data incorporating External multiplying factor due to Installed CTs & PT should be provided.

The software should be capable of preparing CMRI to read the meter information or to reconfigure the meter for change the setting of the meter as per IS 15959:2011.

The BCS should have the facility for ASCII conversion of all recorded meter data. There should be user friendly approach for viewing meter data for the reading collected now or for the

reading collected in the past. All information about a particular consumer should be segregated and available at one place so that locating any consumer's past data is easy. It should be possible to locate/retrieve data on the basis of one of the following particulars:

a) Consumer ID/Number.

b) Meter Sr. No.

c) Date of meter reading.

d) Location.

The BCS shall have multi level password for data protection and security. The first level should allow the user to enter the system. The different software features shall be protected by different passwords. The configuration of passwords should be user definable. **The software installed on one PC should not be copy-able on to another PC.**

It is very important that the BCS has the feature to export available data to ASCII format for integrating with the WBSEDCL billing system. Here again a wizard should be available whereby user can select file format (for ASCII), what data to export, the field width selection (whether 8 characters or 10 characters, to include decimal point or not, number of digits after decimal point etc).

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

12 (twelve) months back up data for Main and TOD Registers for KWH/MWH, KVARH/MVARH (Lag), KVARH/MVARH(Lead), KVAH/MVAH and MD in kW & KVA/MW & MVA with date and time & Average Power factor should be available at BCS end. The means by which MD reset has been done must be available at BCS end data.

22.0   LOAD SURVEY:

The meter should be capable of recording load survey data of **Phase wise Voltage, Phase wise current, Active Energy, Reactive Energy (lag & lead) Apparent Energy and Active and Apparent Demand, Net Power Factor** for a period of minimum **60 POWER ON days** for **15-minute (programmable) integration period**. Default integration period is 15 minutes. Real time & date should be shown in all the load survey graphs and table. All the load survey data should be available in numerical as well as graphical format. It should also be possible to view this data in daily, weekly and monthly formats. The load survey graph should show values.

23.0   MEASUREMENT OF ENERGY

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. Fundamental Energy should be provided in BCS.

The **Fundamental as well as *Total*** Energy shall be logged in the meter memory and be capable of downloading to the BCS through the HHU and be available for viewing at the BCS end.

24.0 MARKING OF METERS

Every meter shall have a nameplate clearly visible and indelible and **distinctly marked** in accordance with the relevant Standard mentioning **"Category – C1" (not applicable for Non-DLMS Meter)**. The following information should appear on an external plate attached to the meter cover.

i) *Manufacturers Name or trademark and place of manufacture.*

ii) Designation of type.

iii) Number of phases and wires.

iv) Serial number of meter.

v) Month and year of manufacture.

vi) Principal unit of measurement.

vii) P.T. Ratio.

viii) Basic Current and rated maximum current.

ix) C.T. Ratio.

x) Reference frequency in Hz.

xi) Meter constant (impulse/unit).

xii) Class index of meter.

xiii) Reference temperature.

xiv) "Property of WBSEDCL"

xv) Purchaser's Order No. & Date.

xvi) Guarantee for 5 & ½ years from the date of supply

xvii) Sign. of insulation.

xviii) Bar coding of Serial Number, month & year of manufacture

xx) Power Factor Range

xxi) BIS marking and License no

xxii) Right and left LED nomenclature

The meter shall also store name plate details as given in the Table - 30 of IS 15959:2011

25.0 COMMUNICATION CAPABILITY

The meter shall be provided with **two ports for communication** of the measured/collected data. **The hardware port (with sealing facility) compatible with RS 232 specifications which shall be used for remote access through suitable Modem and an Optical port complying with hardware** specifications detailed in IEC-62056-21. This shall be used for local data downloading through a DLMS compliant HHU or direct through BCS. Both ports shall support the default and minimum baud rate of 9600 bps.

Optical Cord (i.e. Optical Port of Meter to PC) must be USB type.

Data downloading time from meter to HHU and PC should be within 2 min for meter data without load survey and within 6 min for meter data with load survey.

26.0 HAND HELD UNIT (HHU)

To enable local reading of meters data a **DLMS compliant HHU (DOS Based)** shall be used. The HHU shall be as per IS 15959:2011. It shall be compatible to the DLMS compliant energy meters that are to be procured/supplied on the basis of the specification having **at least one USB communication port.**

27.0 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 and Frequency Fluctuations, and Electromagnetic High Frequency Fields etc. The meter shall be immune to abnormal voltage or frequency generating devices and shall record the occurrence and restoration of all tampers and related snapshots as per Annexure – G of IS 15959:2011

The accuracy of meter should not be affected with the application of abnormal voltage/ frequency generating device such as spark discharge of approximately 35 kV.

The meters should work even in the presence of any two Potential wires.

Meter should work correctly irrespective of phase sequence.

Meter should also be immune for tamper by application of remote induction device i.e. radiated spark through Jammer circuit.

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

a) DLMS compliant HHU.

b) Remote access through suitable communication network.

c) Direct by PC.

Meter should have a continuous and clear indication / annunciation in its display if top cover is removed /open and even refixed **(non roll over)** and only cover open must be logged in BCS without any restoration. Auto scroll display may be sacrificed for that *COVER OPEN .*

Minimum 400 numbers of events (compartment wise) i.e. 200 no. events for occurrences & 200 no. events for restoration with date & time and snapshot should be available in the meter memory.

Default occurrence and restoration time shall be 5 minutes but it shall be programmable.

All the tamper information logged by the meter should be available in BCS with snapshot, Date & Time as per Table 39 of IS 15959:2011 with occurrence and restoration.

Properly designed meter tamper logic with threshold value, should be provided and clearly explained in the bid. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log / record tamper due to source side abnormalities. The meter should be able to distinguish between HT PT fuse blowing and Single Phasing and record the former.

Following are the tampers which need to be incorporated in the meter:
For 33 KV 3Phase 4 Wire Meters:

(Threshold as per Schedule I)

1. Missing Potential (Phase Wise)
2. Voltage Unbalance
3. Low Voltage
4. Power Failure
5. CT Open (Phase Wise)
6. CT Bypass
7. Current Unbalance
8. CT Reversal (Phase Wise)
9. Magnetic Tamper
10. Cover Open
11. 35 KV ESD
12. Jammer

For 11 KV 3Phase 3 Wire Meters:

(Tamper Thresholds should be as per bidders' threshold)

1. Missing Potential (With Phase Indication)
2. Voltage Unbalance
3. Low Voltage
4. CT Reversal (Phase Wise)
5. Current Imbalance
6. Invalid Phase Association
7. Power On/OFF event.
8. Magnetic Tamper
9. Cover open.
10. 35 KV ESD
11. Jammer

For 240 V 3Phase 4 Wire LTCT Meters:

(Threshold as per Schedule I)

1. Missing Potential (Phase Wise)
2. Voltage Unbalance
3. Low Voltage
4. Power Failure
5. CT Open (Phase Wise)
6. CT Bypass
7. Current Unbalance
8. CT Reversal (Phase Wise)
9. Invalid Phase Association
10. Magnetic Tamper
11. Cover Open
12. Neutral Disturbance
13. 35 KV ESD
14. Jammer

28.0 TYPE TESTS

Meters shall be fully type tested as per relevant Standard (latest version). The type test certificates should be submitted along with the offer. Offer without Type Test Report shall be liable for rejection. **The type test certificate shall not be more than five years old**.

29.0 ACCEPTANCE & ROUTINE TESTS:

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

Further Purchaser shall reserve the right to pick up energy meters at random from the lots offered and get the meter tested from NABL accredited lab. The supplier has no right to contest the test results NABL accredited lab or for additional test and has to replace/take corrective action at the cost of the supplier.

30.0   INSPECTION:

The inspection shall be carried out at any stage of manufacture, by the WBSEDCL authorized representatives, with prior intimation to the supplier. The manufacturer shall grant all reasonable facilities for testing free of charge for inspection and testing to satisfy the purchaser that the materials to be supplied are in accordance with their specification.

The supplier shall keep the WBSEDCL informed in advance, about the manufacturing program so that the arrangement can be made for inspection.

The representative / Engineer of the WBSEDCL attending the above testing shall carry out testing as per relevant standards and issue test certificate approval to the manufacturer and give clearance for dispatch.

31.0   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:

a) Organization structure of the manufacturer and his main sub-suppliers (PCBs, SMT cards, CT/PT) with details of 'QA' setup, overall workflow.

b) Copy of system manual showing 'QAP' (Quality Assurance Plan) as actually practiced during manufacturing and final testing.

c) **List of raw materials and critical components (ASIC chip, crystal clock, memory register Chip, transformers, optical ports etc.) with their suppliers and procurement details.**

d) Stage inspection of product before final testing.

e) 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.

f) Testing and calibration facility, date of calibration of test bench, manpower data of bench operators;

g) Sample copies of test certificate of bought out components.

32.0 TESTING FACILITIES:
The Bidder shall have at least the following testing facilities to ensure accurate calibration:
a) *Insulation resistance measurement*

b) *Running at no load*

c) *Starting current test*

d) *Limits of error*

e) *Dial Test*

f) *Power loss in voltage and current ckt.*

g) *Repeatability of error*

h) *Transportation test*

i) *Tamper Test*

j) *Ageing Test*

The Bidder shall give a detailed list of bought out items with name of the manufacturer and details about quality control.

33.0   GUARANTEE

Equipment (Meter) supplied shall be guaranteed for a period of 66 months from the date of supply. Bidders shall guarantee to replace the meters, which are found to be defective/inoperative at the time of installation, or become inoperative/ defective during guarantee period. **Replacements shall be effected within 1 month from the date of intimation**.

The Bank Guarantee shall remain valid for 7½ years with a claim period for six months.

34.0   FIXING & SEALING ARRANGEMENT

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

Necessary provision may be kept for fixing the utility seal also as per CEA guidelines.
The manufacturers seal provided with the meter should be of high quality with tamper proof features.

35.0   Supply of HHU/Tab & Communication Cord (HHU/Tab to PC & Meter to PC)

For every 100 nos. of meters and part thereof one HHU (DOS Based) Analogic Make & 100 nos. communication cord for each type(Optical to Serial Port and Optical to USB Port) should be supplied free of cost. The guarantee period of HH/Tab will be of 66 months from the date of supply.

36.0   SUBMISSION OF SAMPLE & DOCUMENTS

While submitting the Quotation to the Material Controller, Central Stores & Purchase Department, Vidyut Bhavan, 4th Floor, B – Block Kolkata- 700 091, sample meter having all the mentioned features, BCS with allied software and sample of seal etc. along with the **Type Test Certificates, DLMS Certificate and with the test results and ISI Certificate, Tamper Logic, Display Parameters List** is to be submitted to C.E. (DTD), Abhikshan within 13:00 hrs. on declared date and copy of letter indicating acceptance of Sample by the Office of the C.E. (DTD) is to be submitted to the Material Controller prior to Opening of Offer. Offer will not be accepted without submission of sample and the Tender will not be opened. Any other accessories required for

observing the performance & capabilities of the Meter are to be submitted along with offer.Sample meters shall be submitted to C.E. (DTD). A confirmation from C.E. (DTD) regarding submission of sample as detailed below shall have to be submitted along with the Techno-Commercial Bid as follows:-

  i) 3-Phase 4-Wire 240 V, 200/5A. Class of Accuracy 0.5s –

      a. 2No sample . with ultrasonic welding. (for accuracy & tamper)

      b. 1 no sample without ultrasonic welding(for physical verification of components)

      c. 1 no prototype (for verification of ultrasonic welding)

  ii) 3-Phase 3-Wire 11KV, 50/5A. Class of Accuracy 0.5s – 2Nos. with ultrasonic welding.

      a. 2No sample . with ultrasonic welding. (for accuracy & tamper)

      b. 1 no sample without ultrasonic welding(for physical verification of components)

      c. 1 no prototype (for verification of ultrasonic welding)

  iii) 3-Phase 4-Wire 33 KV, 100/1A. Class of Accuracy 0.5s – 2Nos. with ultrasonic welding.

      a. 2No sample . with ultrasonic welding. (for accuracy & tamper)

      b. 1 no sample without ultrasonic welding(for physical verification of components)

      c. 1 no prototype (for verification of ultrasonic welding)

HHU, Power-Pack, Modem along with SIM Card if required, to be brought at the time of testing of sample meters submitted against the tender.

37.0   SCHEDULES:

The Bidder shall submit the following schedules (as per Standard Format), which is part and parcel of the Specification.

Schedule A   Guaranteed Technical Particulars

Schedule B   List of Raw Material(as per enclosed format)

Schedule C   Pre Qualification Condition

Schedule D   List of Documents to be submitted during sample submission

Schedule E   Deviations from Specified Standards (As per standard format of the Bidder)

Schedule F   Deviations from Specified Test Requirements(As per standard format of the Bidder)

Schedule G Deviations from Technical Specification(As per Annexure –IV – Deviation sheet of GCC)

Schedule H   Bidders Experience (As per standard format of the bidder and also Copies of order executed along with GTP of the supplied meters.)

Schedule I   Tamper Thresholds

Schedule - A

GUARANTEED TECHNICAL PARTICULARS FOR
11KV, STATIC TRIVECTOR METERS

Sl.No.	Description	Required Specification	Manufacturer's particulars
1	Maker's name and country	To be mentioned	
2	Type of meter/model	To be mentioned	
3	Accuracy class	0.5S	
4	Parameters displayed	To be mentioned	
5	P.F. Range	0 Lag – Unity - 0 Lead	
6	Basic Current (Ib)	5A	
7	Maximum Current	200 % of Ib	
8	Minimum starting current	0.1% of Ib	
9	Rated Voltage	Ph-Ph : 110 V Ph – N : 63.5 V	
10	Variation of voltage at which meter functions normally	-30% to + 20% of Vref	
11	Rated Frequency	50Hz	
12	Power Loss in Voltage & Current Circuits	Voltage Circuit Less than 1.5W/8VA, Current Circuit Less than 1VA. (Less VA/ Watt getting the preference)	
13	Dynamic range	To be mentioned	
14	MD reset Provisions	a) Through authenticated CMRI or Remote Communication Command b) Automatic resetting at preset date & time.	
15	No. of digits of display and height of character	Seven segment, minm. **8** digit Liquid Crystal Display (LCD) with backlit or LED, having minimum character height of 10 mm.	
16	Size of Non volatile memory	To be mentioned	
17	Principle of operation	To be mentioned	
18	MD Integration period	15 Minutes/5 Minutes (Programmable)	
19	Weight of meter	To be mentioned	
20	Dimensions	To be mentioned	
21	Warranty	5½ years from date of supply	
22	Outline drawings & Leaflets	To be furnished	
23	a) Remote meter-readout facility	To be mentioned	
	b) Communication protocol used.	To be mentioned	
	c) Sealing provision for meter & optical port.	To be mentioned	
	d) Baud rate of data transmission	To be mentioned	

	e) Required software to be resident in CMRI and BCS.	To be mentioned	
	f) Ultrasonic welding of body	To be mentioned	
	g) Manufacturer's Seal provided	To be mentioned	
24	Base Computer Software	Windows 7, 8, 8.1 and 10 based	
25	Type Test Certificates	To be furnished	
26	Time of Day Zones (Selectable)	To be mentioned	
27	Whether meter measures both fundamental & Harmonic Energy	Both required	
28	Real Time Clock Accuracy	Max. drift per annum ±300 for Class 0.5S.	
29	Anti Tamper Features	To be mentioned in details.	
30	Data retention by NVM without battery back up and un-powered condition.	10 years	
31	Guarantee period of meter	5½ Years from the date of supply. Guarantee period shall be printed on the nameplate.	
32	BIS license	To be mentioned	
32.1	BIS license No. & dt. with its validity for ISI certification mark on offered meter.	To be mentioned	
32.2	Details of meter design for which above BIS certification has been obtained: -	To be mentioned	
(i)	Ratio of Ib to Imax		
(ii)	Material of meter body		
(iii)	Grade of printed circuit Board material		
(iv)`	Type of assembly of component used (SMT)		
(v)	Meter constant (IMP / KWh)		
(vi)	Auxiliary power circuit (with PT or PT less)		
(vii)	Accuracy class		
33	ISO accreditation no. & dt. with its validity		
34	Other parameters / features not covered in the above GTP	Conform to specification of IS-14697 / 1999 & CBIP technical report No. 88/325 (with its latest amendment)	
35	Past Experience	Copies of order executed in last three years along with GTP of the supplied meters to be enclosed. Past experience to be considered for manufacturing meter as per IS: 14697 & CBIP-88/325	

GUARANTEED TECHNICAL PARTICULARS FOR , 33KV STATIC TRIVECTOR METERS

Sl.No.	Description	Required Specification	Manufacturer's particulars
1	Maker's name and country	To be mentioned	
2	Type of meter/model	To be mentioned	
3	Accuracy class	0.5S	
4	Parameters displayed	To be mentioned	
5	P.F. Range	0 Lag – Unity - 0 Lead	
6	Basic Current (Ib)	1A	
7	Maximum Current	200 % of Ib	
8	Minimum starting current	0.1% of Ib	
9	Rated Voltage	Ph-P : 110V Ph – N : 63.5 V	
10	Variation of voltage at which meter functions normally	-30% to + 20% of V ref	
11	Rated Frequency	50Hz	
12	Power Loss in Voltage & Current circuits	Voltage Circuit Less than 1.5W/8VA, Current Circuit Less than 1VA. (Less VA/ Watt getting the preference)	
13	Dynamic range	To be mentioned	
14	MD reset Provisions	a) Through authenticated CMRI or Remote Communication Command b) Automatic resetting at preset date & time.	
15	No. of digits of display and height of character	Seven segment, minm. **8** digit Liquid Crystal Display (LCD) with backlit or LED, having minimum character height of 10 mm.	
16	Size of Non volatile memory	To be mentioned	

17	Principle of operation	To be mentioned	
18	MD Integration period	15 Minutes / 5 Minutes(programmable)	
19	Weight of meter	To be mentioned	
20	Dimensions	To be mentioned	
21	Warranty	5½ years from date of supply	
22	Outline drawings & Leaflets	To be furnished	
23	a) Remote meter-readout facility	To be mentioned	
	b) Communication protocol used.	To be mentioned	
	c) Sealing provision for meter & optical port.	To be mentioned	
	d) Baud rate of data transmission	To be mentioned	
	e) Required software to be resident in CMRI and BCS.	To be mentioned	
	f) Ultrasonic welding of body	To be mentioned	
	g) Manufacturer's Seal provided	To be mentioned	
24	Base Computer Software	Windows 7, 8, 8.1, 10 based	
25	Type Test Certificates	To be furnished	
26	Time of Day Zones (Selectable)	To be mentioned	
27	Whether meter measures both fundamental & Harmonic Energy	Both required	
28	Real Time Clock Accuracy	Max. drift per annum ±300 for Class 0.5S.	
29	Anti Tamper Features	To be mentioned in details.	
30	Data retention by NVM without battery back up and un-powered condition.	10 years	
31	Guarantee period of meter	5½ Years from the date of supply. Guarantee period shall be printed on the nameplate.	

32	BIS license	To be mentioned	
32.1	BIS license No. & dt. with its validity for ISI certification mark on offered meter.	To be mentioned	
32.2	Details of meter design for which above BIS certification has been obtained: -	To be mentioned	
(i)	Ratio of Ib to Imax		
(ii)	Material of meter body		
(iii)	Grade of printed circuit Board material		
(iv)'	Type of assembly of component used (SMT)		
(v)	Meter constant (IMP / KWh)		
(vi)	Auxiliary power circuit (with PT or PT less)		
(vii)	Accuracy class		
33	ISO accreditation no. & dt. with its validity		
34	Other parameters / features not covered in the above GTP	Conform to specification of IS-14697 / 1999 & CBIP technical report No.88 & 325 (with its latest amendment).	
35	Past Experience	Copies of order executed in last three years along with GTP of the supplied meters to be enclosed. Past experience to be considered for manufacturing meter as per IS: 14697 & CBIP-325	

GUARANTEED TECHNICAL PARTICULARS FOR
240 V LT CT, STATIC TRIVECTOR METERS

Sl.No.	Description	Required Specification	Manufacturer's particulars
1	Maker's name and country	To be mentioned	
2	Type of meter/model	To be mentioned	
3	Accuracy class	0.5 S	
4	Parameters displayed	To be mentioned	
5	P.F. Range	0 Lag – Unity - 0 Lead	
6	Basic Current (Ib)	5 A	
7	Maximum Current	200 % of Ib	
8	Minimum starting current	0.1% of Ib	
9	Rated Voltage	Ph-P : 415 V Ph – N : 240 V	
10	Variation of voltage at which meter functions normally	-30% to + 20% of Vref	
11	Rated Frequency	50Hz	
12	Power Loss in Voltage & Current circuits	Voltage Circuit Less than 1.5W/8VA, Current Circuit Less than 1VA. (Less VA/ Watt getting the preference)	
13	Dynamic range	To be mentioned	
14	MD reset Provisions	a) Through authenticated CMRI or Remote Communication Command b) Automatic resetting at preset date & time.	
15	No. of digits of display and height of character	Seven segment, minm. 8 digit Liquid Crystal Display (LCD) with backlit or LED, having minimum character height of 10 mm.	
16	Size of Non volatile memory	To be mentioned	
17	Principle of operation	To be mentioned	

18	MD Integration period	15 Minutes/ 5 Minutes (programmable)	
19	Weight of meter	To be mentioned	
20	Dimensions	To be mentioned	
21	Warranty	5½ years from date of supply	
22	Outline drawings & Leaflets	To be furnished	
23	a) Remote meter-readout facility	To be mentioned	
	b) Communication protocol used.	To be mentioned	
	c) Sealing provision for meter & optical port.	To be mentioned	
	d) Baud rate of data transmission	To be mentioned	
	e) Required software to be resident in CMRI and BCS.	To be mentioned	
	f) Ultrasonic welding of body	To be mentioned	
	g) Manufacturer's Seal provided	To be mentioned	
24	Base Computer Software	Windows 7, 8, 8.1, 10 based	
25	Type Test Certificates	To be furnished	
26	Time of Day Zones (Selectable)	To be mentioned	
27	Whether meter measures both fundamental & Harmonic Energy	Both required	
28	Real Time Clock Accuracy	Max. drift per annum ±300 for Class 0.5S.	
29	Anti Tamper Features	To be mentioned in details.	
30	Data retention by NVM without battery back up and un-powered condition.	10 years	
31	Guarantee period of meter	5½ Years from the date of supply. Guarantee period shall be printed on the nameplate.	
32	BIS license	To be mentioned	

32.1	BIS license No. & dt. with its validity for ISI certification mark on offered meter.	To be mentioned	
32.2	Details of meter design for which above BIS certification has been obtained: -	To be mentioned	
(i)	Ratio of Ib to Imax		
(ii)	Material of meter body		
(iii)	Grade of printed circuit Board material		
(iv)'	Type of assembly of component used (SMT)		
(v)	Meter constant (IMP / KWh)		
(vi)	Auxiliary power circuit (with PT or PT less)		
(vii)	Accuracy class		
33	ISO accreditation no. & dt. with its validity		
34	Other parameters / features not covered in the above GTP	Conform to specification of IS-14697 / 1999 & CBIP technical report No.88 & 325 (with its latest amendment).	
35	Past Experience	Copies of order executed in last three years along with GTP of the supplied meters to be enclosed. Past experience to be considered for manufacturing meter as per IS: 14697 & CBIP-325	

SCHEDULE - B

List of Raw Material (as per enclosed format

Sl no	Component Function / Feature	Make / Origin
1	Current Element	
2	Measurement / Computing chips	
3	Memory chips	
4	Display modules	
5	Communication modules	
6	Optical port	
7	Power Supply	
8	Electronic components	
9	Mechanical parts	
10	Battery	
11	RTC / Micro controller	

Schedule-C
Pre-Qualification Conditions for HT Static Meters

Sl. No.	Particulars	Remarks
1	Bidders must have valid BIS certification for the offered meter. If it has started to issue by appropriate authority.	Yes / No
2	Bidder preferably posses ISO 9001 certification	Yes / No
3	Bidder should be manufacturers of static meters having supplied Static LT, 11/33 KV H.T. Meters with memory and LCD display as per IS 14697 & CBIP 325 to Electricity Boards / Utilities in the past3 years	Yes / No
4	Bidders should have dust free, static protected environment for manufacture, assembly and Testing.	Yes / No
5	Bidder should have automatic computerized test bench for lot testing of meters	Yes / No
6	Bidder has facilities of Oven for ageing test.	Yes / No

Schedule-D

Sl. No.	LIST OF DOCUMENTS TO BE SUBMITTED DURING SAMPLE SUBMISSION			
1	Attested copy of type test reports from NABL accredited laboratory as per new IS(If Published			
2	Attested copy of BIS certificates of the same type of meter submitted as sample			
3	Attested certificates as regards material used for meter case, cover & terminal block			
4	Schedule - C			
5	Schedule - B			
6	Operating manual & Tamper logic of the meter submitted			

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Annexure -II

Pre-Qualification Conditions for HT Static Meters

Sl. No.	Particulars	Remarks
1	Bidders must have valid BIS certification for the offered meter. If it has started to issue by appropriate authority.	Yes / No
2	Bidder preferably posses ISO 9001 certification	Yes / No
3	Bidder should be manufacturers of static meters having supplied Static LT, 11/33 KV H.T. Meters with memory and LCD display as per IS 14697 & CBIP 325 to Electricity Boards / Utilities in the past 3 years.	Yes / No
4	Bidders should have dust free, static protected environment for manufacture, assembly and Testing.	Yes / No
5	Bidder should have automatic computerized test bench for lot testing of meters.	Yes / No
6	Bidder has facilities of Oven for ageing test.	Yes / No

Annexure -III

Sl. No.	Component Function / Feature	Make / Origin
1	Current Element	
2	Measurement / Computing chips	
3	Memory chips	
4	Display modules	
5	Communication modules	
6	Optical port	
7	Power Supply	
8	Electronic components	
9	Mechanical parts	
10	Battery	
11	RTC/ Micro controller	

ANNEXURE - IV

SI. No.	LIST OF DOCUMENTS TO BE SUBMITTED DURING SAMPLE SUBMISSION			
1	Attested copy of type test reports from NABL accredited laboratory as per new IS(If Published)			
2	Attested copy of BIS certificates of the same type of meter submitted as sample			
3	Attested certificates as regards material used for meter case, cover & terminal block.			
4	Annexure – II as per tender documents			
5	Annexure – III as per tender documents			
6	Operating manual & Tamper logic of the meter submitted			

ANNEXURE - V

Component Specifications:

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LCD etc., which are PTH type.

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

Sl. no.	Component Function / Feature	Requirement	Make / origin
1.	Current Element	Current Transformer	Any make or origin conforming to IS-2705
2.	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type.	Renasas, Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, NEC, Texas Instruments, ST, Infinion, NEC, Phillips, Teridian, Siemens Freescale, TI
3.	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, Sames, National Semiconductors, Renasas Microchip, Hitachi, Texas Instruments, Phillips, Oki, Avago, Teridian ,ST.
4.	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70o.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range.	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY, Tianma
5.	Communication modules	Communication modules should be compatible for the RS 232 ports.	National Semiconductors, Hitachi, Agilent, Avago, Texas Instruments, HP, Philips, ST, ,Everlight, Siemens, Ligitek, Fairchild
6.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instruments, Siemens, Agilent, Philips, HP, Avago, Osram, Everlight, Siemens

7.	*Power Supply*	*The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.*	*SMPS Type*
8.	*Electronic components*	*The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.*	*Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National Semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS*
9.	*Mechanical parts*	*The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.* *The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.*	
10.	*Battery*	*Lithium / Lithium-ion /NiMh with guaranteed life of 10 years*	*Renata, Panasonic, Varta, Tadiran, Sanyo, National, Tekcell, Duracell, Maxell, Elegance, Xeno Energy, EVE*
11.	*RTC / Micro controller*	*The accuracy of RTC shall be as per relevant IEC / IS standards*	*Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST,Mitsubishi, Freescale chip, Teridian*

Components accepted in any previous tenders of WBSEDCL will be accepted

Table 27 Instantaneous Parameters for Class C Meters

(*Clause* E-2, E-3.2 and E-3.3)

Sl No	Parameter	OBIS Code A.B.C.D.E.F	Interface Class No
(1)	(2)	(3)	(4)
i)	Real Time Clock – Date and Time	0.0.1.0.0.255	8
ii)	Current - IR	1.0.31.7.0.255	3
iii)	Current – IY	1.0.51.7.0.255	3
iv)	Current – IB	1.0.71.7.0.255	3
v)	Voltage – VRN	1.0.32.7.0.255	3
vi)	Voltage – VYN	1.0.52.7.0.255	3
vii)	Voltage – VBN	1.0.72.7.0.255	3
viii)	Voltage – VRY	1.0.32.7.0.255	3
ix)	Voltage – VBY	1.0.52.7.0.255	3
x)	Signed Power Factor –R phase	1.0.33.7.0.255	3
xi)	Signed Power Factor - Y phase	1.0.53.7.0.255	3
xii)	Signed Power Factor - B phase	1.0.73.7.0.255	3
xiii)	Three Phase Power Factor – PF	1.0.13.7.0.255	3
xiv)	Frequency	1.0.14.7.0.255	3
xv)	Apparent Power – KVA	1.0.9.7.0.255	3
xvi)	Signed Active Power – kW (+ Forward; Reverse)	1.0.1.7.0.255	3
xvii)	Signed Reactive Power – kvar (+ Lag; - Lead)	1.0.3.7.0.255	3
xviii)	Number of Power-Failures	0.0.96.7.0.255	1
xix)	Cumulative Power-Failure Duration	0.0.94.91.8.255	3
xx)	Cumulative Tamper Count	0.0.94.91.0.255	1
xxi)	Cumulative Billing Count	0.0.0.1.0.255	1
xxii)	Cumulative Programming Count	0.0.96.2.0.255	1
xxiii)	Billing Date	0.0.0.1.2.255	3
xxiv)	Cumulative Energy kWh	1.0.1.8.0.255	3 / 2
xxv)	Cumulative Energy kVARH Lag	1.0.5.8.0.255	3 / 2
xxvi)	Cumulative Energy kVARH Lead	1.0.8.8.0.255	3 / 2
xxvii)	Cumulative Energy kVAH	1.0.9.8.0.255	3 / 2

NOTES

1)   The items at Sl No v), vi) and vii) are for 3Φ / 4W system of measurement with NEUTRAL as reference point.
2)   The items at Sl No viii) and ix) are for 3 Φ / 3W system of measurement with Y-PHASE as reference point.
3)   Signed Power factor – (+ indicates lag) and (- indicates lead).
4)   The parameters at Sl No xviii) to xxii) hold cumulative values at that instant from the date of manufacturing or installation of meter as the case may be.
5)   The above list is identified for the purpose of communication to HOST or HHU.
6)   The utilities may choose, based on needs, additional parameters for display purpose ONLY.
7)   Item at Sl No xxi) refers to the Billing Period Counter
8)   Item at Sl No xxiii) - Data type to be same as for attribute 2 of IC 8, Clock.

Table 28 : Block Load Survey Parameters for Class C Meters

(*Clauses* E-2, E-4.1 and 4.3)

Sl No	Parameter	OBIS Code A.B.C.D.E.F	Interface Class No / Attribute
(1)	(2)	(3)	(4)
i)	Real Time Clock – Date and Time	0.0.1.0.0.255	8 / 2
ii)	Current - IR	1.0.31.27.0.255	3 / 2
iii)	Current – IY	1.0.51.27.0.255	3 / 2
iv)	Current – IB	1.0.71.27.0.255	3 / 2
v)	Voltage – VRN	1.0.32.27.0.255	3 / 2
vi)	Voltage – VYN	1.0.52.27.0.255	3 / 2
vii)	Voltage – VBN	1.0.72.27.0.255	3 / 2
viii)	Voltage – VRY	1.0.32.27.0.255	3 / 2
ix)	Voltage – VBY	1.0.52.27.0.255	3 / 2
x)	Block Energy – kWh	1.0.1.29.0.255	3 / 2
xi)	Block Energy – kvarh – lag	1.0.5.29.0.255	3 / 2
xii)	Block Energy – kvarh – lead	1.0.8.29.0.255	3 / 2
xiii)	Block Energy – kVAh	1.0.9.29.0.255	3 / 2

NOTES:-
1) The parameters listed in this table are for load survey purpose and are logged as per the block period time.
2) The parameters at Sl No ii) to ix) are the average values during the block period time and stored at the end of that time block.
3) The parameters at Sl No x) to xiii) are the actual energy consumption during that time block.
4) Capture objects for 3 Φ / 4W are items at Sl No i) to vii) and x) to xiii)
5) Capture objects for 3 Φ / 3W are items at Sl No i) to iv) and viii) to xiii)
6) Support for Selective access shall be as defined in Section 11.3

Table 29 :   Billing Profile Parameters for Class C Meters

(Clauses E 5.1 and E 5.3)

Sl.No	Parameter	OBIS Code A.B.C.D.E.F	Interface Class No / Attribute
(1)	(2)	(3)	(4)
i)	Billing Date	0.0.0.1.2.255	3 / 2
ii)	System Power Factor for Billing Period	1.0.13.0.0.255	3 / 2
iii)	Cumulative Energy – kWh	1.0.1.8.0.255	3 / 2
iv)	Cumulative Energy – kWh – TZ1	1.0.1.8.1.255	3 / 2
v)	Cumulative Energy – kWh – TZ2	1.0.1.8.2.255	3 / 2
vi)	Cumulative Energy – kWh – TZ3	1.0.1.8.3.255	3 / 2
vii)	Cumulative Energy – kWh – TZ4	1.0.1.8.4.255	3 / 2
viii)	Cumulative Energy – kWh – TZ5	1.0.1.8.5.255	3 / 2
ix)	Cumulative Energy – kWh – TZ6	1.0.1.8.6.255	3 / 2
x)	Cumulative Energy – kWh – TZ7	1.0.1.8.7.255	3 / 2
xi)	Cumulative Energy – kWh – TZ8	1.0.1.8.8.255	3 / 2
xii)	Cumulative Energy – kvarh – Lag	1.0.5.8.0.255	3 / 2
xiii)	Cumulative Energy – kvarh – Lead	1.0.8.8.0.255	3 / 2
xiv)	Cumulative Energy – kVAh	1.0.9.8.0.255	3 / 2
xv)	Cumulative Energy – kVAh – TZ1	1.0.9.8.1.255	3 / 2
xvi)	Cumulative Energy – kVAh – TZ2	1.0.9.8.2.255	3 / 2
xvii)	Cumulative Energy – kVAh – TZ3	1.0.9.8.3.255	3 / 2
xviii)	Cumulative Energy – kVAh – TZ4	1.0.9.8.4.255	3 / 2
xix)	Cumulative Energy – kVAh – TZ5	1.0.9.8.5.255	3 / 2
xx)	Cumulative Energy – kVAh – TZ6	1.0.9.8.6.255	3 / 2
xxi)	Cumulative Energy – kVAh – TZ7	1.0.9.8.7.255	3 / 2
Sl.No	Parameter	OBIS Code A.B.C.D.E.F	Interface Class No /

			Attribute
xxii)	MD – kW	1.0.1.6.0.255	4 / 2 ,5
xxiii)	MD – kW – TZ1	1.0.1.6.1.255	4 / 2 ,5
xxiv)	MD – kW – TZ2	1.0.1.6.2.255	4 / 2 ,5
xxv)	MD – kW – TZ3	1.0.1.6.3.255	4 / 2 ,5
xxvi)	MD – kW – TZ4	1.0.1.6.4.255	4 / 2 ,5
xxvii)	MD – kW – TZ5	1.0.1.6.5.255	4 / 2 ,5
xxviii)	MD – kW – TZ6	1.0.1.6.6.255	4 / 2 ,5
xxix)	MD – kW – TZ7	1.0.1.6.7.255	4 / 2 ,5
xxx)	MD – kW – TZ8	1.0.1.6.8.255	4 / 2 ,5
xxxi)	MD – kVA	1.0.9.6.0.255	4 / 2 ,5
xxxii)	MD – kVA – TZ1	1.0.9.6.1.255	4 / 2 ,5
xxxiii)	MD – kVA – TZ2	1.0.9.6.2.255	4 / 2 ,5
xxxiv)	MD – kVA – TZ3	1.0.9.6.3.255	4 / 2 ,5
xxxv)	MD – kVA – TZ4	1.0.9.6.4.255	4 / 2 ,5
xxxvi)	MD – kVA – TZ5	1.0.9.6.5.255	4 / 2 ,5
xxxvii)	MD – kVA – TZ6	1.0.9.6.6.255	4 / 2 ,5
xxxviii)	MD – kVA – TZ7	1.0.9.6.7.255	4 / 2 ,5
xxxix)	MD – kVA – TZ8	1.0.9.6.8.255	4 / 2 ,5

NOTES

1) The data are stored up to 6 billing cycles. The Billing profile is modeled as Profile generic (IC: = 7) object with OBIS Code 1.0.98.1.0.255. The capture objects of this load profile are as per Table-29. The capture object values will be copied into buffer of this object either automatically or asynchronously. The capture period is set to zero, billing action is controlled by billing dates as provided in 10 and table 31.
2) Support for Selective access shall be as defined in Section 11.3
3) The current cycle billing parameters shall be readable as the values of the latest billing period, on demand. This shall be in addition to the last 6 billing period data which shall be available in the Profile buffer as the last 6 entries in the buffer
4) The captured attributes in case of Interface Class 4 (Extended register) used for MD values will be attributes 2 and 5 (Value and Timestamp)

Table 30: Name Plate Details Parameters

(*Clause* F-1)

SI No	Parameter	OBIS Code A.B.C.D.E.F	Interface Class
(1)	(2)	(3)	(4)
i)	Meter Serial Number	0.0.96.1.0.255	1 (Data)
ii)	Manufacturer name	0.0.96.1.1.255	1
iii)	Firmware Version for meter	1.0.0.2.0.255	1
iv)	Meter type (3P-3W / 3P-4W)	0.0.94.91.9.255	1
v)	Internal CT ratio	1.0.0.4.2.255	1
vi)	Internal PT ratio	1.0.0.4.3.255	1
vii)	Meter year of manufacture	0.0.96.1.4.255	1
NOTE For item SI No iv), a value of "0" indicates 3P-3W; a value of "1" indicates 3P-4W			

Table 31 Programmable Parameters

(*Clause* F-2)

SI No	Parameter	OBIS Code A.B.C.D.E.F	Interface Class
(1)	(2)	(3)	(4)
i)	Real Time Clock – Date and Time	0.0.1.0.0.255	8 (Clock)
ii)	Demand Integration Period	1.0.0.8.0.255	1 (Data)
iii)	Profile Capture Period	1.0.0.8.4.255	1
iv)	Single-action Schedule for Billing Dates	0.0.15.0.0.255	22
v)	Activity Calendar for Time Zones etc.	0.0.13.0.0.255	20

NOTES

1) The parameters are programmable by the utility engineers with required access rights.
2) Unit for Demand Integration Period and profile capture period is in "seconds".
3) Programming of any of the parameters shall increment the "Cumulative programming count" value.

Table 32 Indian Event Reference Table – Voltage Related

(*Clause* G-1 & G-1.1)

SI No	Event ID	Descriptions
(1)	(2)	(3)
i)	1	R-Phase – PT link Missing (Missing Potential) – Occurrence
ii)	2	R-Phase – PT link Missing (Missing Potential) – Restoration
iii)	3	Y-Phase – PT link Missing (Missing Potential) – Occurrence
iv)	4	Y-Phase – PT link Missing (Missing Potential) – Restoration
v)	5	B-Phase – PT link Missing (Missing Potential) – Occurrence
vi)	6	B-Phase – PT link Missing (Missing Potential) – Restoration
vii)	7	Over Voltage in any Phase - Occurrence
viii)	8	Over Voltage in any Phase - Restoration
ix)	9	Low Voltage in any Phase - Occurrence
x)	10	Low Voltage in any Phase - Restoration
xi)	11	Voltage Unbalance - Occurrence
xii)	12	Voltage Unbalance - Restoration

Table 33 Indian Event Reference Table – Current Related
(*Clause* G-1 & G-1.1)

SI No	Event ID	Descriptions
(1)	(2)	(3)
i)	51	Phase – R CT reverse – Occurrence
ii)	52	Phase – R CT reverse – Restoration
iii)	53	Phase – Y CT reverse – Occurrence
iv)	54	Phase – Y CT reverse – Restoration
v)	55	Phase – B CT reverse – Occurrence
vi)	56	Phase – B CT reverse – Restoration
vii)	57	Phase – R CT Open - Occurrence
viii)	58	Phase – R CT Open - Restoration
ix)	59	Phase – Y CT Open - Occurrence
x)	60	Phase – Y CT Open - Restoration
xi)	61	Phase – B CT Open - Occurrence
xii)	62	Phase – B CT Open - Restoration
xiii)	63	Current Unbalance - Occurrence
xiv)	64	Current Unbalance - Restoration
xv)	65	CT Bypass – Occurrence
xvi)	66	CT Bypass – Restoration
xvii)	67	Over Current in any Phase – Occurrence
xviii)	68	Over Current in any Phase – Restoration

Table 34 Indian Event Reference Table – Power Related

Sl No	Event ID	Descriptions
	101	Power failure (3 phase) – Occurrence
	102	Power failure (3 phase) – Restoration

Table 35 Indian Event Reference Table – Transaction Related

(*Clause* G-1 & G-1.1)

Sl No	Event ID	Descriptions
(1)		
i)	151	Real Time Clock – Date and Time
ii)	152	Demand Integration Period
iii)	153	Profile Capture Period
iv)	154	Single-action Schedule for Billing Dates
v)	155	Activity Calendar for Time Zones etc.

Table 36 Indian Event Reference Table – Others

(*Clause* G-1 & G-1.1)

Sl No	Event ID	Descriptions
(1)		
i)	201	Influence of Permanent Magnet or AC/ DC Electromagnet - Occurrence
ii)	202	Influence of Permanent Magnet or AC/ DC Electromagnet - Restoration
iii)	203	Neutral Disturbance - HF & DC - Occurrence
iv)	204	Neutral Disturbance - HF & DC - Restoration
v)	205	Very Low PF - Occurrence
vi)	206	Very Low PF - Restoration

Table 37 Indian Event Reference Table – Non Roll Over Events

(*Clause* G-1 & G-1.1)

Sl.No.	Event ID	Descriptions
	251	Meter Cover Opening – Occurrence

Table 38 Indian Event Reference Table – Control Events

(*Clause* G-1.1)

Sl No	Event ID	Descriptions
(1)	(2)	(3)
	301	Meter disconnected
	302	Meter connected

Table 39 Capture Parameters for Events

(*Clauses* B-6.4, B 6.5 and G-1)

SI No	Parameter	A	B	C	D	E	F	IC
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Date and Time of event	0	0	1	0	0	255	8 (Clock)
ii)	Event Code	0	0	96	11	0	255	1 (Data)
iii)	Current - IR	1	0	31	7	0	255	3 (Register)
iv)	Current - IY	1	0	51	7	0	255	3 (Register)
v)	Current – IB	1	0	71	7	0	255	3 (Register)
vi)	Voltage VRN (3 Φ / 4W)	1	0	32	7	0	255	3 (Register)
vii)	Voltage VYN (3 Φ /4W)	1	0	52	7	0	255	3 (Register)
viii)	Voltage VBN (3 Φ /4W)	1	0	72	7	0	255	3 (Register)
ix)	Voltage VRY (3 Φ / 3W)	1	0	32	7	0	255	3 (Register)
x)	Voltage VYB (3 Φ /3W)	1	0	52	7	0	255	3 (Register)
xi)	Power Factor – R phase	1	0	33	7	0	255	3 (Register)
xii)	Power Factor – Y phase	1	0	53	7	0	255	3 (Register)
xiii)	Power Factor – B phase	1	0	73	7	0	255	3 (Register)
xiv)	Cumulative Energy – kWh	1	0	1	8	0	255	3 (Register)

Schedule I

33 KV Meter 3Phase 4 Wire

	TAMPERS	Occurrence. Condition	Reset. Conditions	OCC Time (min)	Reset Time (min)
1	Missing Potential	$V_X < 15\%$ V_{ref}	$V_X > 40\%$ V_{ref}		5
		Any other phase voltage > 70% of V_{ref}	Any other phase voltage > 70% of V_{ref}		
		Current Ignored	Current Ignored		
		Missing potential tamper detection will be phase wise			
2	Voltage Unbalance	$V_{3x} > 70\%$ V_{ref}	$V_{3x} > 70\%$ V_{ref}		5
		Vmax-Vmin > 10% V_{ref}	Vmax-Vmin < 10% V_{ref}		
		Current Ignored	Current Ignored		
3	Low Voltage	$V_X < 70\%$ V_{ref}	$V_{3x} > 71\%$ V_{ref}		5
		Current Ignored	Current Ignored		
4	Power Failure	If power goes off for more than the persistence time	Power Restores	5	Immediate
5	CT Open	Residual Current > 20% Ib	Residual Current < 20% Ib		5
		$I_X < 2\%$ Ib	I_X Ignored		
		Average line Current : Ignored	Average Current > 10% of Ib		
6	CT Bypass	Residual Current > 20% Ib	Residual Current < 20% Ib		5
		$I_X > 2\%$ Ib	I_X Ignored		
		Average line Current : Ignored	Average Current > 10% Ib		
7	Current Unbalance	Residual Current < 20% I_b	Residual Current < 20% I_b		5
		$I_{max} - I_{min} > 30\%$ 0f I_{max} for that period	$I_{max} - I_{min} < 29\%$ 0f I_{max} for that period		
		Average Line Current > 5% I_b	Average Line Current > 10% I_b		
		Calculated In > 5% of I_b	Calculated In > 5% of I_b		
8	CT Reversal	$I_X > 10\%$ I_b	$I_X > 10\%$ I_b		5
		Direction : Negative	Direction: Positive		
		Net Power Factor > 0.3	Net Power Factor > 0.3		
		CT Reversal detection will be phase wise			

33 KV Meter 3Phase 4 Wire

	TAMPERS	Occurrence. Condition	Reset. Conditions	OCC Time (min)	Reset Time (min)
9	**Invalid Phase Association**	When association of current phase with voltage phase is mismatched. For Example: For Voltage phase R-Y-B , Current phase association is Y-B-R	When Voltage and current association is proper. For example: For voltage phase R-Y-B current phase is also R-Y-B.	5	
10	**Magnet**	Whenever the meter functionality gets affected on account of magnetic field, meter log it as an event and recording starts on Imax or it remains immune. Same shall be logged with date and time stamp.	30 sec	30 sec	
11	**Cover Open**	On removal of meter cover the meter will log cover open event along with date and time.	Immediate. No Restoration		
		V_{3X}= Voltage in All Phases			
		V_x= Voltage In Any Phase			
		I_{3X}= Current in All Phases			
		I_X= Current in any phase			

11 KV Meter 3 Phase 3 Wire

	TAMPERS	Occurrence. Condition	Reset. Conditions	OCC Time (min)	Reset Time (min)
1	**Missing Potential**	$V_x < 15\%\ V_{ref}$	$V_x > 40\%\ V_{ref}$	5	
		Any other phase voltage >70% of V_{ref}	Any other phase voltage > 70% of V_{ref}		
		Current Ignored	Current Ignored		
		Missing potential tamper detection will be phase wise			
2	**Voltage Unbalance**	$V_{3x} > 70\%\ V_{ref}$	$V_{3x} > 70\%\ V_{ref}$	5	
		$V_{max} - V_{min} > 10\%\ V_{ref}$	$V_{max} - V_{min} < 10\%\ V_{ref}$		
		Current Ignored	Current Ignored		
3	**Low Voltage**	$V_x < 70\%\ V_{ref}$	$V_{3x} > 71\%\ V_{ref}$	5	
		Current Ignored	Current Ignored		
4	**Power Failure**	If power goes off for more than the persistence time	Power Restores	5	Immediate
5	**CT Open**	Residual Current >20% I_b	Residual Current< 20% I_b	5	
		$I_x < 2\%\ I_b$	I_x Ignored		
		Average line Current :Ignored	Average Current > 10% of I_b		
6	**CT Bypass**	Residual Current >20% I_b	Residual Current <20% I_b	5	
		$I_x > 2\%\ I_b$	I_x Ignored		
		Average line Current :Ignored	Average Current > 10% I_b		
7	**Current Unbalance**	Residual Current > 20% I_b	Residual Current < 20% I_b	5	
		$I_{max} - I_{min} > 30\%$ 0f I_{max} for that period	$I_{max} - I_{min} < 29\%$ 0f I_{max} for that period		
		Average Line Current> 5% I_b	Average Line Current> 10% I_b		
		Calculated $I_n > 5\%$ of Ib	Calculated $I_n > 5\%$ of I_b		
8	**CT Reversal**	$I_x > 10\ \%\ I_b$	$I_x > 10\ \%$ Ib	5	
		Direction : Negative	Direction: Positive		
		Net Power Factor> 0.3	Net Power Factor> 0.3		
		CT Reversal detection will be phase wise			

11 KV Meter 3 Phase 3 Wire

	TAMPERS	Occurrence. Condition	Reset. Conditions	OCC Time (min)	Reset Time (min)
9	Magnet	Whenever the meter functionality gets affected on account of magnetic field, meter log it as an event and recording starts on Imax or it remains immune. Same shall be logged with date and time stamp.		30 sec	30 sec
10	Cover Open	On removal of meter cover the meter will log cover open event along with date and time.		Immediate. No Restoration	
		V_{3X}= Voltage in All Phases V_x= Voltage In Any Phase I_{3X}= Current in All Phases I_X= Current in any phase			

240 V LT CT Meter 3 Phase 4 Wire

	TAMPERS	OCC. Condition	REST. CONDITIONS	OCC TIME (MIN)	REST. TIME (MIN)
1	**Missing Potential**	Vx< 30% Vref	Vx> 40% Vref	5	
		Any other phase voltage > 70% of Vref	Any other phase voltage > 70% of Vref		
		Current Ignored	Current Ignored		
		Missing potential tamper detection will be phase wise			
2	**Voltage Unbalance**	V3x> 70% Vref	V3x> 70% Vref	5	
		Vmax-Vmin > 30% Vref	Vmax-Vmin < 29% Vref		
		Current Ignored	Current Ignored		
3	**Low Voltage**	Vx< 70% Vref	V3x> 71% Vref	5	
		Current Ignored	Current Ignored		
4	**Power Failure**	If power goes off for more than the persistance time	Power Restores	5	Immediate
5	**CT Open (Phase Wise)**	Residual Current >20% Ib	Residual Current<20% Ib	5	
		Ix< 2% Ib	Ix Ignored		
		Average line Current :Ignored	Average Current > 10% of Ib		
6	**CT Bypass**	Residual Current >20% Ib	Residual Current <20% Ib	5	
		Ix>2% Ib	Ix Ignored		
		Average line Current :Ignored	Average Current > 10% Ib		
7	**Current Unbalance**	Residual Current < 20% Ib	Residual Current < 20% Ib	5	
		Imax- Imin> 30% 0f Imax for that period	Imax- Imin<29% 0f Imax for that period		
		Average Phase Current> 10% Ib	Average Phase Current> 10% Ib		
		In> 2% of Ib	Neutral Current ignored		
8	**CT Reversal**	Ix> 10 % Ib	Ix> 10 % Ib	5	
		Direction : Negative	Direction: Positive		
		Net Power Factor> 0.3	Net Power Factor> 0.3		
		CT Reversal detection will be phase wise			

240 V LTCT Meter 3Phase 4 Wire

	TAMPERS	OCC. Condition	REST. CONDITIONS	OCC TIME (MIN)	REST. TIME (MIN)
9	**Invalid Phase Association**	When association of current phase with voltage phase is mismatched. For Example: For Voltage phase R-Y-B ,Current phase association is Y-B-R	When Voltage and current association is proper. For example: For voltage phase R-Y-B current phase is also R-Y-B.	5	
10	**Magnet**	Whenever the meter functionality gets affected on account of magnetic field, meter log it as an event and recording starts on Imax or it remains immune. Same shall be logged with date and time stamp.	30 sec	30 sec	
11	**Cover Open**	On removal of meter cover the meter will log cover open event along with date and time.	Immediate. No Restoration		
12	**Neutral Disturbance**	Bidders' Logic	Bidders' Logic	Bidders' Choice	

- In Case of Neutral Disturbance Tamper the meter may remain Immune and maintain its class of accuracy.
- If not immune from neutral disturbance then the meter should record energy with positive error.

V_{3X}= Voltage in All Phases

V_x= Voltage In Any Phase

I_{3X}= Current in All Phases

I_X= Current in any phase