

WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

Technical Specification for AC 1 Phase 2Wire 240V LT Solid State (Static) Whole Current Import - Export Energy Meter of 1.0 Class Accuracy and 5-30A Current Rating with Pilfer Proof Meter Box

1.0 SCOPE

1.1 This scope covers design, engineering, manufacture, testing, inspection and supply of AC 1 Phase 2 Wire 240V LT Solid State (Static) Whole Current Import – Export Energy Meter of 1.0 Class Accuracy and 5-30A Current Rating with backlit LCD display. The meter shall be capable of recording and displaying energy in kWh & demand in kW (*both in Export & Import mode*) for power factor having the range of zero lag-unity-zero lead. Meter shall have facility / capability of recording tamper information & load survey of active energy (both import & export), Apparent Energy (both import & export) , Active Demand (both import & export) , Phase current, Neutral Current, Phase Voltage & Other parameters in non volatile memory.

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

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

Sl. No.	Standard No.	Title
1	IS13779:1999 read with its latest amendments	Specification of AC Static Watt Hour meters, Class 1.0 and 2.0
2	CBIP Report No. 325 & its latest amendments, if any	Specification for AC Static Electrical Energy Meters
3	IS 12346 :1988	Specification for testing equipment for AC Static Electrical Energy Meter (latest amendment)
4	IEC687 – 1992	Specification of AC Static Watt Hour meters for active energy (Class 1.0)
5	CBIP Technical Report III	Specification for Common Meter Reading Instrument
6	IS 13410 :1992 with latest amendment	Specification for Pilfer Proof Meter box suitable for 1 Phase Static Energy Meter
7	<u>IS 15959:2011 with latest amendments</u>	<u>Data exchange for electricity Meter reading, Tariff and Load Control – Indian Companion Specification.</u>

3.0 CLIMATIC CONDITIONS :

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions. Meters shall be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions. The meters shall be suitably designed and treated for normal life and satisfactory operation under hot and hazardous tropical climatic 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 provides suitable protection to them from any injurious effect of excessive humidity.

- 3.1 Maximum Ambient Air Temperature in shade: 55⁰ C
- 3.2 Minimum Ambient Air Temperature: (-)10⁰ C
- 3.3 Maximum Relative Humidity: 95%(non-condensing)
- 3.4 Minimum Relative Humidity: 10%
- 3.5 Height above mean sea level: Up to 3000 meters
- 3.6 Average number of tropical monsoon per annum: 5 months
- 3.7 Annual Rainfall: 100 mm to 1500 mm
- 3.8 Maximum Wind Pressure : 150 Kg/Sqm

4.0 SUPPLY SYSTEM :

System	<u>1 Phase 2 Wire</u>
Rated voltage (V _{ref})	240 V – Phase to Neutral
Rated Current	Basic current 5 Amps (I _b), Maximum current 30 Amps (I _{max})
Rated Frequency	50 Hz

5.0 POWER FACTOR RANGE: The meter shall be lag only in import mode suitable for full power factor range from zero (lagging) through unity to zero (leading).

6.0 POWER SUPPLY VARIATION: The meter shall be suitable for working with following supply system variations.

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

7.0 ACCURACY

- 8.1 Class of accuracy of the meter shall be 1.0.
- 8.2 Maximum error limit at 1% I_b and UPF shall not exceed ±2%.
- 8.3 There shall be no drift in accuracy, at least for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the bidder shall have to replace the meter with a new one free of cost.

8.0 POWER CONSUMPTION

- 9.1 Voltage Circuit: The active and apparent power consumption in the voltage circuit/phase at reference voltage, reference temperature and reference frequency shall be less than 1.5 W / 8 VA as per IS 13779.
- 9.2 Current Circuit: The apparent power taken by current circuit/phase at basic current, reference frequency and reference temperature shall be less than 4 VA as per IS 13779.

9.0 STARTING CURRENT & RUNNING AT NO LOAD

- 9.1 The meter shall start registering energy at 0.2% of basic current at unity power factor and shall be fully functional within five seconds after the rated voltage is applied.
- 9.2 Running at no load: When 70% & 120% voltage is applied and no current flows in the current circuit, the test output of the meter shall not produce more than one pulse.

10.0 MAXIMUM CONTINUOUS CURRENT :

The maximum continuous current in meters shall be the current at which the meter purports to meet the accuracy requirement of the specification. The same is indicated in table in Supply System Clause of this specification.

11.0 CONSTRUCTION :

- 11.1 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 shall be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter shall ensure consistence in performance under all conditions especially during heavy rains / very hot weathers. The insulating materials used in the meter shall be non-hygroscopic, non-ageing & have tested quality. The meter shall 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 i.e. break to open type. This is to be achieved by using continuous Ultrasonic welding (or by using any other technology which is either equally or more efficacious) on all the four sides of the meter base and cover.
- 11.2 The meter shall comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB shall compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter shall be compatible with 16 Bit (or better) ASIC with compatible processor and meter shall be based on Digital measuring and sampling technique.
- 11.3 The meter shall be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover shall be transparent / translucent. But the viewing portion shall be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it shall not be black in colour. The meter casing shall not change in shape, colour, size and

dimensions when subjected to 72 hrs on UV test as per ASTM D 53. It shall withstand 650°C glow wire test and heat deflection test as per ISO 75 or as per IEC 60068 -2-5.

11.4 In addition to the above, the meter cover shall be sealable to the meter base with at least 2 no. of bar coded seals bearing the identification marks of the manufacturer. Suitable arrangement shall be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be made possible without removing the seal. There shall also be provision for sealing at the optical port.

11.5 The polycarbonate material of only the following manufacturers shall be used:

11.5.1 **G.E. Plastic** : LEXAN 943A or equivalent like 943, 123R for meter cover & terminal cover / LEXAN 503R or equivalent like 500, 143R for meter base and terminal block.

11.5.2 **BAYER** : Grade corresponding to above

11.5.3 **DOW Chemical** : --do--

11.5.4 **MITSUBISHI** : --do--

11.5.5 **TEJIN** : --do--

11.5.6 **DUPONT** : --do--

12.0 METER CASE AND COVER :

12.1 In case, ultrasonic welding using plate / strip is used, the material of plate / strip shall be same as that of cover and base and the strip. The manufacturer's logo shall be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.

12.2 The meter cover shall be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws shall be covered with transparent caps (not required for screw less design), ultrasonically welded with the meter body and the screw covers shall be embedded in the meter body in a groove. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.325 including 0.2T AC Magnet, 0.5T Permanent magnet.

13.0 TERMINAL BLOCK AND COVER:

13.1 The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block shall 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. It shall be rigidly fixed to the base of the meter so that it cannot be separated from the meter base without breaking either the meter base or the terminal block and this fixing arrangement shall be in parallel to the meter base in such a way that it cannot be viewed or approached from any part of the meter without breaking the meter.

13.2 The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor. The screws shall have thread size not less than M4 and head having 6 mm diameters. The screws shall not have pointed ends at the end of threads. All terminals and connecting screws and washers shall be of tinned / nickel plated brass material. The terminal shall withstand glow wire test at 960°C ± 15°C and the terminal shall withstand at least 135°C as per IS.

- 13.3** The internal diameter of terminal hole shall be minimum 5.5 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.
- 13.4** The terminal cover shall be transparent re-enforced 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 shall be sufficient to accommodate adequate length of external cables.
- 13.5** The terminals and all connecting screws will be of suitable material capable of withstanding a current of 150% of I_{max} for two hours, continuously and the meter shall be capable of providing phase to neutral protection up to 433 V for 1(one) hour.

14.0 MARKING OF THE METER :

The marking on the meter shall be in accordance with relevant clauses of IS 13779. The basic marking on the meter nameplate shall be as follows. All other markings as per IS shall also be there.

- 14.1** Manufacturer's name & trade mark
- 14.2** Type Designation
- 14.3** No. of phases & wires
- 14.4** Serial number (Size not less than 5mm)
- 14.5** Month & year of manufacture
- 14.6** Reference Voltage
- 14.7** Rated Current
- 14.8** Operating Frequency
- 14.9** Principal unit(s) of measurement
- 14.10** Meter Constant (imp/kwh)
- 14.11** Class index of meter
- 14.12** "Property of WBSEDCL"
- 14.13** Purchase Order No. & Date
- 14.14** Guarantee (Guaranteed for a period of 5 ½ years from the date of delivery)
- 14.15** BIS marking
- 14.16** Place of manufacture
- 14.17** Bar coded Serial no. of the meter along with manufacturing year & month.
- 14.18** The reference temperature if different from 27 °C.
- 14.19** The sign of Double Square for insulating encased meters.

- 15.0 CONNECTION DIAGRAM AND TERMINAL MARKING:** Every meter shall be indelibly marked with a diagram of connection. It is permissible to indicate the connection diagram by an identification figure in accordance with relevant standards. The marking of meter terminals shall appear on this diagram.

16.0 DISPLAY OF MEASURED VALUES :

- 16.1 The meter shall have alphanumeric display with at least 7 9 full digit with LCD backlit display, having minimum character height of 10 mm. The data shall be stored in nonvolatile memory. The non-volatile memory shall retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.
- 16.2 It shall be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciation which shall be self explanatory and symmetric.
- 16.3 In addition to provide Serial Number of the meter on the display plate, the meter serial no. shall also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.
- 16.4 Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parameters to be provided (Factory programmable). Back lit provided for clear visibility shall be uniform throughout all part of the LCD.
- 16.5 The meters shall have auto-display mode for pre-selected parameters. Push-Button mode of display shall display all parameters and it shall have priority over auto mode. The meter shall give clear message on display to indicate that the meter has experienced tamper and the nature of tamper with date and time of first occurrence, last occurrence and last restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, last restoration and last occurrence.
- 16.6 Connection check-and self diagnostic shall give clear message on display. The meter shall have a test output (blinking **LED**) accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device shall be provided in the form of one common LED for active and reactive energy with the provision of selecting the parameter being tested (separate LED may also be used with proper separation).

17.0 DISPLAY SEQUENCE: The meter shall display the required parameters in two different modes as follows. Display sequence for both auto and Push button must be maintained, no interchange in sequence or display parameter will be accepted. All the displays shall have proper legends to identify the same.

17.1 Auto Display Mode: The following parameters shall be displayed in auto cycle mode, in the following sequence.

17.1.1 *Cumulative Active Import Energy in kWh*

17.1.2 *Cumulative Active Export Energy in kWh*

17.1.3 Cover Open Information with date and time

17.2 Push Button mode: In addition to the auto display mode parameters, the following parameters shall be displayed on pressing the push button i.e. all display of auto mode and the display as per following.

17.2.1 LCD test

17.2.2 Meter Serial Number

- 17.2.3 Real Date
- 17.2.4 Real Time
- 17.2.5 Cumulative Active Energy (KWH)- Import
- 17.2.6 TOD Wise Cumulative Active Energy (KWH)- Import
- 17.2.7 Cumulative Active Energy (KWH)- Export
- 17.2.8 TOD Wise Cumulative Active Energy (KWH)- Export
- 17.2.9 Cumulative Apparent Energy (KVAH)- Import
- 17.2.10 Cumulative Apparent Energy (KVAH)- Export
- 17.2.11 History 1 Cumulative Active Energy –Import
- 17.2.12 History 1 TOD Wise Cumulative Active Energy –Import
- 17.2.13 History 1 Cumulative Active Energy – Export
- 17.2.14 History 1 TOD Wise Cumulative Active Energy – Export
- 17.2.15 Present Month MD KW – Import with date and time
- 17.2.16 Present Month MD KW – Export with date and time
- 17.2.17 History 1 MD KW- Import with date and time
- 17.2.18 History 1 MD KW- Export with date and time
- 17.2.19 Instantaneous Voltage
- 17.2.20 Instantaneous Phase Current (With Current direction)
- 17.2.21 Instantaneous Neutral Current (With Current direction)
- 17.2.22 Signed Instantaneous Power Factor
- 17.2.23 Signed Instantaneous Active Power
- 17.2.24 Instantaneous Apparent Power
- 17.2.25 Instantaneous Frequency
- 17.2.26 Cumulative Tamper Count
- 17.2.27 First Occurrence with Date & Time
- 17.2.28 Last Occurrence with Date & Time
- 17.2.29 Last Restoration with Date & time
- 17.2.30 High Resolution Display for KWH both import and export (minimum 2+4)
- 17.2.31 Connection Check (when phase is forward or reverse)
- 17.2.32 Self Diagnosis

17.3 Power OFF Mode Display:

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

17.4 Display for Auto and manual mode must be listed by two headers:

- 17.4.1 “Auto Display Mode”
- 17.4.2 “Push Button Mode” (Parameters shall be pasted in front of the PP Box)

17.5 Display: Other requirements:

- 17.5.1 Each parameter shall be on meter display for 10 sec and the time gap between two auto display cycles shall be ~~120~~ 20 sec.

- 17.5.2 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 shall not roll over in between this duration.
- 17.5.3 High resolution display can be given in separate mode and its registers required in display min 2+4 digits (for kWh) after decimal in case of Energy.

17.6 Besides other details as to be provided in “Auto” & “Push Button” display modes, and, their derivatives, the following parameters shall have to be made available through BCS in downloaded data.

- 17.6.1 TOD wise Cumulative kWh (Import) – Month-wise History for last 12 months
- 17.6.2 TOD wise Cumulative kWh (Export) - Month-wise History for last 12 months
- 17.6.3 TOD wise Maximum Demand in kW(Import) with date & time – Month-wise History for last 12 months
- 17.6.4 TOD wise Maximum Demand in kW(Export) with date & time – Month-wise History for last 12 months
- 17.6.5 TOD Wise Cumulative kWh(Import) (up-to-date)
- 17.6.6 TOD Wise Cumulative kWh(Export) (up-to-date)

18.0 MAXIMUM DEMAND REGISTRATION AND RESET:

Meter shall continuously monitor and calculate the average maximum demand for each demand interval time of 30 minutes and maximum of these in a calendar month (both for import & export) shall be stored along with date and time when it occurred. The maximum demand shall automatically reset at 24:00 hours of the last date or 00:00 hours of the first date of each calendar month and the corresponding value along with date/time stamp shall be transferred to Billing (History) registers.

The integration period shall be set as 15 minutes, on real-time basis.

19.0 ANTI TAMPER FEATURES :

The meter shall be capable of recording energy accurately at Import as well as Export mode. If current flows in forward direction, the meter shall register energy in Import counter and if phase current flows in reverse direction, it shall register energy in Export counter. **Visual Indication for export mode operation, single wire, ND, Magnet, Cover Open shall be available in meter LCD display.**

The meter shall have the following anti-tamper features and register energy accurately under the following conditions taking the values of phase current and neutral current into account and calculating energy on whichever of the two is higher:

19.1 Drawing of current through local earth

The meter shall register accurate energy even if the load is not terminated back to the meter and instead current is drawn partially or fully through a local earth irrespective of the phase and neutral connections to the meter. “Earth load indication” shall appear in display with logging of tamper, if difference between phase current and neutral current is found to be more than 6%. Test will be done through actual load. In this case allowable limit will be within 2% w.r.to Master Meter.

19.2 Drawing of load by disconnecting Neutral of meter & outgoing Earth:

When neutral is disconnected from both load side and supply side, the meter shall record energy as per rated parameters (Vref, UPF & actual current). Accuracy must be maintained within $\pm 4\%$.

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

19.4 Meter shall record energy with maximum error of (+) 6% to (-) 4% on Injection of DC (+)ve & DC (-) ve in neutral having magnitude up to 400 V & injection of chopped AC in neutral & injection of pulsating D.C. in meter neutral. Tests in this respect will be conducted by using a device available with WBSEDCL for chopped AC injection (60V to 300V) & steady DC injection & Pulsating DC injection set. Steady DC voltage will be rectified from a three phase power supply. Single phase Circuit diagram of the device enclosed with the tender documents.

19.5 Meters shall offer compliance to requirements of CBIP-325 and its amendments for tampering using external magnets. The meter should be immune to tamper using external magnets. The meters should be immune to 0.2T of A.C. magnetic fields and 0.2 T of D.C. magnetic fields, beyond which it should record as tamper if not immune. Meter should record I_{max} with the application of 0.5T permanent magnet with logging in BCS, if not immune. **Energy Registration should be in Import mode only at I_{max}.**

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

19.7 The registration shall not be affected more than + 4% if high frequency (55Hz to 100Hz) or low frequency (45Hz to 30 Hz) AC signal w.r.t. earth is applied to the meter neutral. Meters which are immune or will maintain better accuracy, will be preferred.

19.8 *The meter shall be capable of recording occurrence and restoration with date and time in respect to the following tamper events:*

19.8.1 Power failure

19.8.2 *Single Wire / Neutral Missing*

- 19.8.3 *Neutral Disturbances*
- 19.8.4 *Magnetic Disturbances*
- 19.8.5 *Earth Tamper*

- 19.9** Threshold Values of all above occurrence and restoration are attached in Annexure --. Snapshot values of Phase Voltage, Phase Current, Power Factor, Active Energy value during occurrence & restoration to be provided in all the above mentioned tamper conditions in BCS with date and time. (In Event logging Snapshots shall be considered when the actual phenomenon occurred).
- 19.10** All authenticated commands shall be Base Computer Software (BCS) controlled. All transactions with meter shall be date and time logged, in the downloaded data (Last 12 month's transactions).
- 19.11** A minimum of 300 events (one event means either occurrence or restoration) of all types of tamper with date & time stamping along with snapshots of V, I, PF and kWh shall be available in meter memory and logging will be on FIFO basis.
- 19.12** Meter shall have a continuous and clear indication in its display if top cover is removed / opened and even re-fixed (non rollover) and only cover open must be logged in BCS without any restoration. COVER OPEN tamper is to be displayed after every parameter displayed in Auto Display Mode.

20.0 LOAD SURVEY The meter shall be capable of recording load survey for the following parameters for a period of minimum 60 days - subject to availability of all parameters listed below with **30 minutes integration period** and the following load survey data must be available in BCS **in graphical as well as tabular format**:

- 20.1** Energy in KWh (Import & Export mode shall be shown clearly)
- 20.2** Energy in KVAh (Import & Export mode shall be shown clearly)
- 20.3** Demand in KVA and KW, (Import & Export mode shall be shown clearly)
- 20.4** Voltage
- 20.5** Current Phase
- 20.6** Current Neutral
- 20.7** Power Factor.

The Load Survey data for above parameters should be viewed at BCS end in daily, weekly and monthly formats. Data Export facility to excel files for generation of reports should be available at BCS end.

21.0 The NVM shall not require any additional battery backup to retain the data in case of power failure, for up to 10 years and the data storage shall be independent of battery backup unit. The life of the RTC battery in circuit condition shall be minimum 10 years in case of power failure. It shall be possible to transfer this data to base computer software through MRI/Laptop or RMR. The data so obtained shall be displayed in both graphical & numeric form in the BCS. The BCS with all details is to be provided by the supplier at no extra cost.

22.0 TIME OF DAY FACILITIES : The meter shall have facilities to record Active, Apparent Energies and MD in at least 8 zones. The time zones shall be user programmable through authenticated

MRI/Laptop/RMR command. Necessary software for the same is to be provided by the bidder. At present TOD timings will be programmable as follows:

22.1 TOD 1: 06:00 Hrs to 17:00 Hrs.

22.2 TOD 2: 17:00 Hrs to 23:00 Hrs.

22.3 TOD 3: 23:00 Hrs to 06:00 Hrs.

23.0 METER READING DURING POWER OFF: It shall be possible to read the meter-display visually and with CMRI/Lap top in absence of input voltages with the help of internal battery backup. In case of external battery the arrangements shall be such that hands free operation is possible. In case of external battery 10 years guarantee must be given for external battery/power pack. Separate battery shall be used for this purpose (Not RTC or processor battery). Battery for downloading and display power up purpose shall not be less than 650 mAh ($\pm 10\%$) or it shall be chargeable.

24.0 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 shall be recorded in the meter memory. The bidder shall furnish the details of self-diagnostic capability feature, viz Memory status (NVM) and Battery status, RTC Status etc. and it shall be in display **as well as BCS**".

25.0 INFLUENCE QUANTITIES :The meter shall work satisfactory with guaranteed accuracy as per limit provided in IS: 13779 (clause No.9.2.1 and 11.2) .

26.0 COMMUNICATION CAPABILITY:

26.1 The meter shall have a galvanic isolated Optical Port as per IEC 1107/ANSI/PACT so that it can be easily connected to a handheld Common Meter Reading Instrument (CMRI)/Laptop/PC for data transfer. The optical port shall be provided with proper sealing arrangement so that its cover can't be opened without breaking its seal.

26.2 The stored data in the meter shall be available through CMRI even when the display of the meter is not available.

27.0 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

27.1 The Common Meter Reading Instrument (CMRI) shall be loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading and/or downloading meter data.

27.2 Windows (Windows 7.0 and higher version) based Base Computer Software (BCS) shall be provided for receiving data from CMRI and downloading instructions from BCS to CMRI.

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

- 27.4** Six no. of BCS shall have to be provided for downloading data and authenticated command from CMRI/ Laptop.
- 27.5** The BCS shall have facility to convert meter reading data into user definable ASCII file format so that it can be integrated with the billing system or any other third party software. The user shall have the flexibility to select the parameters to be converted into ASCII file.
- 27.6** All the data available in the meter including energy, MD etc. with date and time stamp, new TOD time zones and historical data shall be available in BCS after down loading.
- 27.7** The bidder shall supply the necessary CMRI software during sample meter testing.
- 27.8** The bidder has to supply the meter reading protocol and API free of cost. The bidder shall indicate the relevant standard to which the protocol is compliant.
- 27.9** Transfer of data from the meter to CMRI & then to the BCS shall be easily executed.
- 27.10** Any change or up gradation of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.
- 27.11** The same software shall 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 etc. The exhaustive online help shall be available with the software so that user can use all the features of the software by just reading the help contents.
- 27.12** In BCS 12 months data backup for following parameters may be available
- a) KWH Import [Total & TOD Wise], b) KWH Export [Total & TOD Wise], c) KVAH Import [Total & TOD Wise], d) KVAH Export [Total & TOD Wise], d) Demand in KW and KVA Import [Total & TOD Wise], e) Demand in KW and KVA Export [Total & TOD Wise], f) Average PF (Import & Export), g) Average Load Factor, h) Power ON Hours.
- Cumulative Active Demand since Manufacture for both Import and Export should be available at BCS end.

28.0 GUARANTEED TECHNICAL PARTICULARS: The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed Technical Particulars and data, appended with this Specification.

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

29.1 The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchasers' representative.

29.2 The manufacturer shall have at least the following testing facilities to ensure accurate calibration:-

29.2.1 AC high voltage test

- 29.2.2 Insulation test
- 29.2.3 Test of no load condition
- 29.2.4 Test of Starting condition
- 29.2.5 Test on Limits of error (Automatic Testing facility with ICT)
- 29.2.6 Power loss in voltage and current circuit
- 29.2.7 Test of Repeatability of error
- 29.2.8 Test of meter constant
- 29.2.9 Test of magnetic influence (As per CBIP 325 & Permanent Magnet)

30.0 QUALITY ASSURANCE PLAN: The design life of the meter shall be minimum 20 years and to prove the design life the firm shall have at least the following quality Assurance Plan.

ANNEXURE-I

GUARANTEED TECHNICAL PARTICULARS OF AC THREE PHASE FOUR WIRE, L.T. STATIC, WHOLE CURRENT (5-30)A IMPORT EXPORT ENERGY METER WITH LCD DISPLAY

Sl. No.	Item Description	Manufacturer's Particulars
1.	Name of manufacturer	
2.	Type (Model No.), name & number	
3.	Standard Applicable	IS: 13779/1999, IS:12346/1988,IS: 14434/1998, CEA regulation no. 502/70/CEA/DT&D dt.17.03.06 and CBIP technical report no.325 with its latest amendment as on date.
4.	Rating	
(i)	Accuracy Class	Class 1.0
(ii)	Rated Voltage	240V Ph to Neutral (+20% to -30%)
(iii)	Rated current	I _b -5 Amp, I _{max} - 30 Amp
(iv)	Rated frequency	50 Hz ± 5%
(v)	Power factor	0 lag to unity to 0 lead
(vi)	Minimum saturation current	Bidders to specify
(vii)	Meter Constant (imp / KWH)	
5. (i)	Maximum. Continuous current rating (Amp.)	30 Amps
(ii)	Continuous current rating of terminals for two hours	45 Amps
(iii)	Running with no load & (-)70% to 120 % voltage	No creeping
6.	Short time over current for 10 mili seconds	30 I _{max} for one half cycle at rated frequency
7.	Starting current at which meter shall run & continue to run	0.4% of I _b at rated voltage and unity power factor
8.	Power loss at rated frequency & reference temperature	
(a)	Current circuit at rated current	Less than 4 VA per phase
(b)	Voltage circuit at rated current	Less than 1.5W / 10VA per phase
9.	Type of material used	
(a)	Base	High impact strength, non-hygroscopic, fire retardant, fire resistant, UV stabilised poly carbonate (Lexan 503R or equivalent). Meter base with LEXAN 500R/143R may be accepted subject to verification.
(b)	Meter cover	High impact strength, non-hygroscopic, fire retardant, fire resistant, UV stabilized transparent poly carbonate (Lexan 943A or equivalent)

(c)	Terminal Block	Material High impact strength not hygroscopic, fire retardant, fire resistant, UV stabilized poly carbonate (Lexan 503R or equivalent) Barrier of adequate size shall be provided between phase and neutral. Terminal block with LEXAN 500R/143R may be accepted subject to verification.
(d)	Terminal cover	High Impact strength, non-hygroscopic, fire retardant, fire resistant, glass reinforced poly carbonate (Transparent)& non detachable with hinging arrangement (Lexan 943A or equivalent). Terminal cover with LEXAN 143 may be accepted subject to verification.
(f)	Screw	
	(i) Material	Tin/Nickel-plated Brass
	(ii) Size	As per relevant IS Standards
10.	Internal diameter of Terminal Hole	Min. 9.5 <u>5.5</u> mm
11.	Centre to Centre clearances between adjacent terminals	13 mm
12.	Transducers	
	(i) Input	CT provided in phase element and in the neutral. Voltage: Potential divider (PT less)
	(ii) Output	LCD
	(iii) CT - no. of turns	Bidders to specify
13.	Type of Register	LCD suitable for operation up to 60°C
	(i) No. of Digits	7 9
	(ii) Size of Numerals	10.0 X 5 mm (minimum)
14.	Display	
	(i) On up and down Scroll Mode & Auto display mode	Both required
	(ii) Type of push button	Spring loaded push button to be provided on top cover of meter to read parameters.
15.	Reading on power off condition	Meter shall be able to display reading during power outage with backup power through the push button provided on the meter. All data down loading facility shall be provided in power off condition.
16.	Battery of Real time clock	
	(i)	It shall be Lithium-ion battery having at least 10 years of life
	(ii)	The drift in time shall not exceed +/- 3 minutes per year
17.	Fixing/sealing arrangement	
	(i) Fixing of meter	3 fixing holes (one at top & two at bottom under sealable terminal cover). The top fixing screw shall not be accessible after meter is fixed to Pilfer Proof Meter Box base.

(ii)	Sealing of meter cover to Base	At least, two fixing screws for fixing meter cover with the meter base shall be provided. Each Screw shall have two holes one for fitting/fixing of manufacturer's seal and the other for utility seal. The arrangement shall be in such manner that any access to the working part of the meter body will not be possible without breaking/ tampering / removing the said seals. Suitable arrangement shall be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be possible without removing the seals. There shall also be provision for sealing at the optical port. The meter cover shall be permanently fixed to the base by ultrasonic welding or by any other technology which is either equally or more efficacious so that cover cannot be opened without breaking, i.e. the meter shall be break to open type. Meter shall have an indication in its display if top cover is removed.
18.	Type of hinged undetectable terminal cover	Terminal cover shall be hinged.
19.	Performance of meter in tamper conditions	
(i)	Input and output Terminals interchanged	Shall work within specified accuracy
(ii)	Change of phase sequence	Shall work within specified accuracy
(iii)	Phase current reverse	Shall work within specified accuracy
(iv)	Indication of above tamper condition	LCD / LED indication.
20.	Suitability of meter to sustain over voltage i.e. phase to phase voltage injected between phase & neutral	Shall sustain
21.	Electromagnetic compatibility (EMI / EMC severity level)	As per IS 13779: 1999
22.	(i) Effect on accuracy of external electromagnetic interference of electrical discharge, external Magnetic field	Shall work within accuracy as per latest IS & CBIP report -325 with latest amendment.
	(ii) Current reversal, Neutral disturbance & Magnetic tamper logging in memory	Meter shall log last 300 events with date and time
23.	Effect on accuracy under tamper conditions / influence conditions	Shall work within accuracy specified in IS: 13779 / 1999, and CBIP tech. Report 325. Error beyond +/- 4 % will not be acceptable for conditions not specified in IS: 13779 / 1999 & CBIP tech. Report 325.
24.	Drift in accuracy of measurement with time	No Drift in accuracy in measurement with time
25.	Name plate details	It shall cover all the details as prescribed in relevant Clause of tech spec.

26.	Approximate weight of meter	Bidders to specify
27.	Type of mounting	Projection type
28.	Calibration	Meter shall be software calibrated at factory & there shall not be any mechanical form of calibration, such as, mechanical preset / trim port / potentiometer etc. so that any adjustment in calibration is not possible after freezing the meter constant.
29.	Manufacturing activity	
	(i) Mounting of components on PCB shall be SMT type	SMT type and ASIC technology
	(ii) Compliance to assurance	To be complied
30.	Testing facility	
	(i) Fully automatic computerized meter test bench with print out facility shall be available	Must be available
	(ii) Make and Sl. No. of Test bench with calibration validity	Bidders to specify
	(iii) Accuracy of ESS duly calibrated	Bidders to specify
	(iv) Following in house testing facility shall be available:	
	(i) AC high voltage test	Must be available
	(ii) Insulation test	Must be available
	(iii) Test of no load condition	Must be available
	(iv) Test of Starting condition	Must be available
	(v) Test on Limits of error	Must be available
	(vi) Power loss in voltage and current circuit	Must be available
	(vii) Test of Repeatability of error	Must be available
	(viii) Test of meter constant	Must be available
	(ix) Power loss in voltage & current circuit	Must be available
	(x) Test of Magnetic influence	Must be available
31.	Whether offered meter type tested as per ISS 13779 / 1999 Table-20 for all the following tests (indicate name of laboratory / Reference of report No. & date.)	Relevant Clause of General Requirement.
	(i) Vibration test	12.3.2
	(ii) Shock test	12.3.1
	(iii) Spring Hammer test	12.3.3
	(iv) Protection against penetration of dust and water	12.5
	(v) Test of resistance to heat & fire	12.4
	(vi) Power consumption	12.7.1

(vii)	Influence of supply voltage	12.7.2
(viii)	Voltage dips and interruptions	12.7.2.1.
(ix)	Short time over current	12.7.3
(x)	Influence of self heating	12.7.4
(xi)	Influence of heating	12.7.5
(xii)	Impulse voltage test	12.7.6.2
(xiii)	AC high voltage test	12.7.6.3
(xiv)	Insulation test	12.7.6.4.
(xv)	Radio Interference measurements	12.9.5
(xvi)	Fast transient burst test	12.9.4
(xvii)	Electrostatic discharge	12.9.2
(xviii)	Immunity to electro-magnetic H.F. field	12.9.3.
(xix)	Test for meter constant	12.15
(xx)	Test of starting conditions	12.14
(xxi)	Test of no load condition	12.13
(xxii)	Ambient temp. influence	12.12
(xxiii)	Test of influence quantities	12.11
xxiv)	Interpretation of test results	12.16
(xxv)	Repeatability error test	12.17
(xxvi)	Dry heat test	12.6.1
(xxvii)	Cold test	12.6.2
(xxviii)	Damp heat cycle test	12.6.3
(xxix)	Test of influence of immunity to Earth fault	12.8
(xxx)	Limits of error	11.1
32.	Guarantee period of meter	5-1/2 years from the date of supply. Guarantee period shall be printed on the nameplate
33.	BIS license	
33.1	BIS license No. & dt. with its validity for ISI certification mark on offered meter.	Bidders to specify.
33.2	Details of meter design for which above BIS certification has been obtained: -	Bidders to specify.
(i)	Ratio of I_b to I_{max}	
(ii)	Material of meter body	
(iii)	Type of energy registering counter	
(iv)	Type of technology (Digital/Analog)	
(v)	Grade of printed circuit Board material	

(vi)	Type of assembly of component used (SMT)	
(vii)	Meter constant (Imp / KWh)	
(viii)	Auxiliary power circuit (with PT or PT less)	
(ix)	Current circuit (CT / Shunt combination or only shunt)	
(x)	Accuracy class	
34.	Other parameters / features not covered in the above GTP	Conform to specification of IS 13779: 1999 & CBIP technical report No.325 (with its latest amendment).