

/TECHNICAL SPECIFICATIONS FOR MICROPROCESSOR BASED THREE PHASE FOUR WIRE 0.2s ACCURACY CLASS STATIC ELECTRONIC ABT TYPE TRIVECTOR ENERGY METERS

1.0 SCOPE

This specification covers the design, engineering, manufacturing, assembly, and testing before supply and delivery at site supply, installation, testing at site and successful commissioning CT and VT operated microprocessor based 3-phase 4-wire metering system with 0.2s accuracy class energy meters , associated essential equipments, along with accessories, and associated Base Computer Software (as detailed in this specification) One static type composite meter along with one check meter shall be installed for each circuit, as a self-contained device for measurement of power transmittals, as described herein, in each successive **15 / 5 minute** block, and certain other functions, detailed in the following paragraphs.

All meters shall be capable for implementing the Availability Based Tariff (ABT) on user configurable data.

The metering system shall be capable for transferring all the required metering data of each sub station to remote computers on line and on real time basis, (supply of computers is not under the scope of this specification) to a central location, as per requirements of Meter Polling Software enclosed herein.

- 1.1** The material shall, however, conform in all respects to the best industry standards of engineering, design and workmanship and shall be capable of performing for continuous commercial operation in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered equipment shall be complete in all respects including all components, accessories and devices for effective and trouble free operation according to the specifications. Such components, devices, software, time correction utility etc., shall be deemed to be within the scope of contractor's supply irrespective of whether they are specifically brought out in the scope of supplies, or not.

If desired, the supplier may be required to coordinate with the prospective SCADA vendor to ensure that the supplied meters are successfully integrated with the purchaser's communication system.

2.0 APPLICABLE STANDARDS

2.1 STANDARDS FOR METERS

The meters shall conform (for testing, performance and accuracy) in all respects the relevant Indian/International standards with latest amendments thereof unless otherwise specified.

IEC: 687-1992 - Alternating Current Static watt-hour meters for measurement of active energy, class 0.2.

CBIP Technical Report No. 88 (read with latest amendments issued) – specifications for AC Static Electricity Energy Meters.

IEC:1268 (1995) Alternating Current Static VAR hour meters for reactive energy.

IS:14697 (1999) AC static transformer operated Watt-hour and VAR-hour meters for class 0.2s and 0.5s.

IS:15959:2011 – Indian standard for Data exchange for Electricity Meter Reading, Tariff and Load control- Companion specification.

Degree of Protection – **IS :12063**

Climatic Proofing of Electrical Equipment – **IS: 3202.**

Color for ready mixed paints **IS:5** (For Metering Cubicles)

3.0 SERVICE CONDITIONS

The meters to be supplied against this specification shall be required to operate satisfactorily, accurately and continuously under the following tropical conditions of hot, humid, dusty, rust and fungus prone environment.

i. Location	At 400/220/132kV Sub Stations in Uttar Pradesh
ii. Max. ambient air temperature (° C)	50
iii. Min. ambient air temperature (° C)	2
iv. Average daily ambient air temp. (° C)	32
v. Max. Relative Humidity (%)	74
vi. Max. Altitude above mean sea level (m)	1000
vii. Average Annual Rainfall (mm)	1200
viii. Max. wind pressure (Kg / Sq.m)	195
ix. Isoceraunic level (days per year)	50
x. Seismic level (Horizontal Accn.)	0.3 g

4.0 PRINCIPAL PARAMETERS

The energy meters shall be indoor/outdoor type connected with the secondary side of outdoor current and voltage transformers.

<u>Sl.No.</u>	<u>Item</u>	<u>Specification</u>
i.	Type of Installation	Indoor/outdoor
ii.	CT secondary	1 A
iii.	VT secondary	110 V/ $\sqrt{3}$ Volts
iv.	System frequency	50HZ \pm 5%
v.	Earthing System	Solidly Grounded

5.0 TECHNICAL REQUIREMENTS

5.1 The meters shall be suitable for being connected directly through its terminal block to voltage transformers (VTs) having a rated secondary line- to- line voltage of 110 V, and to current transformers (CTs) having a rated secondary current of 1A. Any further transformers/transducers required for their functioning shall be in-built in the meters. Necessary isolation and/or suppression shall also be built-in, for protecting the meters from surges and voltage spikes that occur in the VT and CT circuits in extra high voltage switchyards.

5.2 The active energy (Wh) measurement shall be carried out on 3 phase, 4 wire principle with an accuracy as per class 0.2 of IEC –687 1992-06 (Second edition). The energy shall be computed directly in CT and VT secondary quantities, and indicated in watt-hours. The meters shall compute the active energy and load import (W & Wh), active energy and load export (W & Wh) from the substation bus bars during each successive **15 / 5 minute** block, and store it in its memory. It shall also display on demand the **15 / 5 - minute** energy (Wh) (Import and Export Shall be displayed in separate registers, or with a +/- sign) for the

previous **15 / 5 -minute** block. Additionally, the meter shall also display cumulative active energy import (Wh) and active energy export (Wh) using same option.

Meters shall be suitable for working under balanced / unbalanced loads at full power factor range i.e. Zero lag-Unity-Zero lead. The display shall preferably indicate direct values without having to apply any multiplying factor.

The meters shall also be capable to work correctly without affecting accuracy on **railway traction feeders**, which has a provision of only two phases. No. of meters, to be allotted for railway traction feeders, shall be intimated at the time of allotment.

- 5.3** The meter shall continuously compute the average of the RMS values (fundamental only) of the three line-to-neutral VT secondary voltage as a percentage of 63.51 V, and display the same on demand.
- 5.4** The meter shall also compute the reactive power (VAR) on 3-phase, 4-wire principle, with an accuracy as specified in clause 5.6, and integrate the reactive energy (VARh) algebraically into two separate registers, one for the period for which the average RMS voltage is 103% or higher, and the other for the period for which the average RMS voltage is below 97.0%. The current reactive power (VAR), with a minus sign if negative, and cumulative reactive energy (VARh) readings of the two registers shall be displayed on demand. The readings of the two registers at each midnight shall also be stored in the meter's memory.
The reactive power and reactive energy transmittals shall be computed in VAR/VARh directly calculated in CT and VT secondary quantities. Lagging & Leading reactive power flow on both export and import events shall either be recorded through a +/- sign or on separate registers.
- 5.5** The meters shall fully comply with all stipulations in IEC Publication 687 1992-06 (Second Edition) for 0.2s class Static watt-hour meters, except those specifically modified by this specification. The reference ambient temperature shall be 27+/-02° C.
- 5.6** Errors shall comply with CBIP recommendations for all power factor angles from 0 to 360 degrees. For reactive power (VAR) and reactive energy (VARh) measurement limits of errors for both active as well as reactive energy in all the four quadrants shall be in accordance to IEC 687, as detailed herein separately.
- 5.7** The meter display shall be of dot matrix format Alfa numeric LCD (with back-lit) or LED type. Suitable, protected and sealable enclosure shall be provided for conveniently accessing all the metering data using soft keypad/push buttons.
- 5.8** The three line-to-neutral voltages shall be continuously, monitored. In case any of these falls below a value likely to cause malfunctioning of the meter, a visual indication/display shall appear, which shall go off if all three voltages become normal. The time blocks in which such a voltage failure occurs/persist shall also be recorded in the meters memory.
- 5.9** The meters shall normally operate with the power drawn through the VT supply. The total burden imposed by a meter for measurement or operation shall not exceed **10 VA** on any of the phases for **voltage circuits** and 1.0 VA for **current circuits** as per IS : 14697. An automatic backup for continued operation of the meter's calendars & clock, and for retaining all data stored in its memory, shall be provided through a long life battery, which shall be capable of supplying the required power for at least two years. The meters shall be supplied duly fitted with the batteries, which shall not require to be changed for at least ten years, as long as total VT supply interruption does not exceed two years. All the metering data shall be stored in non-volatile memory, which shall not be affected in the event of battery failure.

The meters shall be of self powered type and back up shall be provided through internal recharge - able battery which allows data downloading/data communication to a remote terminal through optical port/remote communication port in the event of supply failure.

- 5.10** Each meter shall have a built in calendar and clock, having an accuracy of **+/-01 minutes** per year or better. The calendar and clock shall be correctly set at the manufacturer's works. The date (day-month-year) and time (hour-min-sec) shall be displayed on the meter front on demand. Only limited clock adjustment by authorized users, after password authentication shall be possible at site, using the MRI or remotely using time synchronization signal through remote network. All clock corrections shall be registered in the meters memory and suitably shown on print out of collected data.
- 5.11** Each meter shall have a unique identification code, which shall be marked permanently on its front, as well as in its memory. All meters supplied to UPPTCL as per this specification shall have their identification code starting with "UP", which shall not be used for any other supplies. UP shall be followed by a dash and a four digit running serial number, further followed by a dash and "A". ('A' being adopted to indicate 1Amp CT secondary).
- 5.12** Each of the metering system shall measure and display the following quantities/parameters as required:
- a) Processor's identification code and model: UP1234A.
 - b) LED/LCD segment check
 - c) Real Time
 - d) Date dd-mm-yy
 - e) Cumulative active energy import (kWh)
 - f) Last 15 minutes block average of the active power / load import.
 - g) Cumulative active energy export (kWh).
 - h) Last 15 minutes block average of the active power / load export.
 - i) Cumulative Reactive energy for the voltage high condition. (ie. Net kVarh when RMS voltage >103% Vn.
 - j) Cumulative Reactive energy for voltage low condition. (ie. Net kVarh when RMS voltage <97% Vn.
 - k) Instantaneous three phase average power factor with sign/display/legend for lag/lead.
 - l) Instantaneous Phase Voltage.
 - i) R Phase ii) Y Phase iii) B Phase
 - m) Instantaneous Line Currents (Amps).
 - i) R Phase Line Current ii) Y Phase Line Current iii) B Phase Line Current.
 - n) Instantaneous Frequency.
 - o) Phase Sequence of voltages (alternatively, this may be provided at MRI/BCS end.
 - p) Instantaneous Active Load in Watt (kW).
 - q) Instantaneous Reactive Load in kVar.
- 5.13** Other display on selection through key pad-
- a) Cumulative active energy import reading (kWh) of predefined date & time for monthly billing purpose.
 - b) Cumulative active energy export reading (kWh) of predefined date & time for monthly billing purpose.

5.14 LOAD SURVEY:

Each meter shall have a non-volatile memory in which the following shall be automatically stored in each successive **15 / 5 minutes' successive** block:

- 1. Active Energy Import
- 2. Active Energy Export
- 3. Apparent Energy Import

4. Apparent Energy Export
5. Average frequency
6. Average load (kW)
7. Average system voltage
8. Reactive Energy lag (when Active Energy Import).
9. Reactive Energy lead (when Active Energy Import).
10. Reactive Energy lag (when Active Energy Export).
11. Reactive Energy lead (when Active Energy Export).
12. Power off time.

15 / 5 -minute average of the above parameters shall be available for last at least 65 days. The load survey data should be available in the form of bar charts as well as in spreadsheets. The BCS shall have the facility to give complete time synchronized load survey data both in numeric and graphic form.

The offered metering system shall store the midnight values of the following electrical parameters:

1. Active energy import in 6 digits.
2. Active energy export in 6 digits.

5.15 BILLING PARAMETERS

The metering system shall store following parameters corresponding to defined bill dates-

1. Active energy import,
2. Active energy export,
3. Apparent Energy import,
4. Apparent Energy export,
5. Reactive high energy register
6. Reactive low energy register
7. Maximum Demand (Import and Export).

The meters shall store all the above listed data in their memories for a period of minimum 6 months.

- 5.16** Each meter shall have an optical port on its front for tapping all data stored in its memory. Portable or hand held Common Meter Reading Instruments (CMRI) shall be used for this purpose to serve as the interface between the meters specified above and the local personal computers (PC). The overall intention is to transmit the desired data on line in real time and also tap the data stored in the meter's memories once a week/month, and dump the same via CMRI to a PC running the BCS software, via an independent communication bus architecture. It shall also be possible to obtain a print out (hard copy) of all data collected from the meters, using the local PC.

The whole system shall be such as to provide a print out (both from the local PC, and from remote central computer) in a user defined format to be informed later on. The BCS software shall be programmed to get customized outputs.

Each meter shall also have a visual test output device having either a single switch able output device or two separate output devices for checking the accuracy of active energy (Wh) as well as reactive energy (Varh). Suitable pulsing rate shall be adopted for wh and varh measurements.

- 5.17** The meters shall safely withstand the usual fluctuations arising during faults etc. In particular, VT secondary voltage 115% of rated voltage applied continuously and 190% of rated voltage applied for 3.0 seconds, and CT secondary current 150% of rated current applied continuously and 30 times of rated applied for 0.5 seconds shall not cause any damage to or

mal-operation of the meters. The immunity to external magnetic field shall be strictly as per latest CBIP recommendations.

- 5.18** In addition to optical port & RS-232 port for data communication, the ABT meter should also have RS-485(in & out) port and **Ethernet port**. Also all the communication ports should work & communicate simultaneously.
- (a) The Energy meter communication cable 1 no. off 1500mm length for communicating with energy meter to MRI. The cable should be flexible shielded and two ends of the cable shall be stress relieved.
- 5.19** The meters shall also withstand without any damage or mal operation, reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. They shall have not less than an IP-51 category of construction, and shall be capable of satisfactory operation in an indoor/outdoor, non-air-conditioned installation.
- 5.20** The meters shall continue to function, as specified above, in case of failure of one or two phases of VT supply. In case of a complete VT supply failure, the computation of average frequency shall be done only for the period during which the VT supply was available in the 15 – minute block. Any time block contraction or elongation for clock correction shall also be duly accounted for.
- 5.21** The harmonics shall be filtered out while measuring Wh, VAR and VARh, and only fundamental qualities shall be measured/computed.
- 5.23** Meters shall be able to store reactive energy consumption during the specified peak hour period in addition to total active energy consumption.
Peak - hour period will be as intimated by the Engineer Of Contract. It shall be possible to retrieve this data through communication ports. Meters shall also be able for implementing the TOD consumption on multiple tariff rates on per day basis.

The TOD Zones shall be as follows:

- a) 17:00 to 22:00 hrs.
- b) 22:00 to 06:00 hrs.
- c) 06:00 to 10:00 hrs.
- d) 10:00 to 17:00 hrs.

- 5.24** If desired by the purchaser, all features of the meter including remote communication via an adopted communication network shall be demonstrated by the bidder at a randomly selected site so as to ensure complete integration of the offered system with the communication system of the purchaser.
- 5.25** The guarantee period of the ABT meters along with all accessories, shall be thirty-six (36) months from the actual date of commissioning or forty-two (42) months from the date of receipt of material at site, whichever is earlier. Accordingly, the successful bidder shall have to submit 10% performance B.G. valid for forty-two (42) months with effect from date of receipt of last consignment at site, for faithful performance of the equipment.
The security deposit and performance Bank guarantees, both shall be executed on non-judicial stamp paper (s) of requisite value (Rs.5/-per thousand subject to maximum of Rs. 10,000.00)

6.0 TAMPER AND ANOMALY DETECTION FEATURES

The meters shall have an appropriate recording system whereby any attempt of tampering the meter is promptly registered with date and time tagging. The system should be able to provide the following information pertaining to tampering events taken place since last demand reset.

The meter should have features to detect the occurrence and restoration of, at least, the following anomaly:

- a) Potential Imbalance: The meter shall be capable of detecting and recording occurrence and restoration of unbalance of voltage. In case of occurrence of such an event a pulse output shall be given through a volt free contact. The rating of the contact shall be 110/220 V DC, 100mA.)

Following tamper features shall be available on the display units:

- Voltage unbalance
- R phase potential missing
- Y phase potential missing
- B phase potential missing
- Feeder supply fail

- b) Current Imbalance: The meter shall be capable of detecting and recording occurrence and restoration of unbalance of current. In case of such a event a pulse output shall be given through a volt free contact. The rating of the contact shall be 110V DC, 100mA.

Following tamper features shall be available on the display units:

- Current imbalance
- R phase current missing
- Y phase current missing
- B phase current missing
- R phase CT reversal
- Y phase CT reversal
- B phase CT reversal

C) Following additional tampers should also be provided in meters

- Power Fail and Power Resume
- Magnet deduction
- Neutral detection
- Meter cover open detection

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Logic for calculation of voltage and current imbalance shall be furnished by the tenderer. Last 100 such events shall be stored in the meter.

Tamper data shall be available in the specified format below:

- i) Date of first occurrence of tampering.
- ii) Time of first occurrence of tampering.
- iii) Time of first restoration of tampering.
- iv) Date of last restoration to normal condition.
- v) Number of occurrence of tampering events.

7.0 SELF DIAGNOSTIC FEATURES

The meter shall have the facility of continuous and automatic monitoring of the healthiness of its various electronic devices and circuits. In case of malfunctioning of any of the device and circuit, the meter shall indicate the same with convenient means.

8.0 CUBICLES FOR METERING SYSTEM

- 8.1 Suitable metering cubicles shall be supplied to mount the meters and associated terminal blocks, power supply etc. as a stand alone unit to be installed at each substation, which shall be capable of supporting all Main & Check meters. At least eight meters (Four main and four

check) along with necessary hardware shall be installed in one metering cubicle... The metering cubicle shall have a door switch and space heater controlled by thermostat and switch, powered by 220V auxiliary AC supply.

- 8.2** The cubicles, confirming to at least IP 55 degree of protection shall be properly treated and painted with light gray shade no. 631 as per IS 5. The wiring shall be carried out with multi-core super flexible, fire retardant, low smoke, PVC insulated color coded wires of 2.5 Sq. mm. cross section and 1.1 KV grade.

The load bearing members and frames shall be made of 2 mm CRCA and doors and covers shall be fabricated from 1.6 mm CRCA.

- 8.3** All meters within one cubicle shall be connected to a common data highway through a standard RS232 link.

- 8.5** A total of eight nos. Test Terminal blocks (TTB), one for each meter, are to be provided in each metering cubicle. The TTB are to be provided with sealable top covers screws and these are to be mounted inside the metering cubicle in such a way that they are accessible only when the door of the metering cubicle is in open condition. The cables coming from the outdoor CTs/PTs for each of the eight nos. meters are to be connected to the Terminal blocks, suitable nos. of which are to be provided inside the metering cubicle. Necessary wiring is to be provided between the Terminal blocks and each of the TTBs and between the TTBs & location where each meter is to be housed inside the metering cubicle.

- 8.6** The front side of the meter shall be clearly accessible for accessing the data directly or through the MRI.

- 8.7** Suitable sealing arrangements are to be provided in each metering cubicle.

- 8.8** The bidder has to provide the detailed drawings of the metering cubicle, alongwith ts all accessories.

- 8.9** The minimum dimensions of the metering cubicle shall be 1500mmx600mmx600mm (HxWxD)

- 8.10** The metering cubicle of the ABT metering system shall be its integral part and the bidders are intimated that the price evaluation shall be carried out after including the prices of the ABT meters and the metering cubicle. The successful bidder shall have to supply the ABT meters alongwith the metering cubicle.

9.0 **SEALING ARRANGEMENT**

Each meter, shall be able to be sealed individually, including the optical communication port.

Suitable arrangement shall be provided for frequent access to meter readings only, without requiring to fiddle the meter seals and that of the metering cubicle.

- 10.0** The bidder shall be responsible for commissioning of the metering cubicle along with the ABT meters, mounted inside the metering cubicle at each substation. Normally one cubicle is allotted for one substation. Separate rates are to be quoted for commissioning of the metering cubicle and each ABT meter, mounted inside the cubicle, as the no. of ABT meters to be installed inside the cubicle may vary from substation to substation.

REQUIREMENT AND FEATURES OF THE BASE COMPUTER SOFTWARE

The BCS shall have at least the following facilities/features:

- i)** It shall be possible to read data received from the meter reading instrument/data collection device.
- ii)** It shall be possible to dial the ABT meters installed at remote sites and read.
- iii)** It shall be possible to schedule the metering system for a sequence of automatic dialling and reading the metering module.
- iv)** It shall be possible to export the data in both ASCII and XML formats for detailed analysis and billing.
- v)** It shall include appropriate multilevel security/password protection for control inputs and data output so that unauthorised person does not have access to the critical system data.
- vi)** The BCS shall be executable on MS WINDOWS 98/2000/XP operating system.
- vii)** The application software shall be fully compatible for implementing ABT, TOD, Tamper and anomalies in a user friendly and user definable format.
- viii)** It should be possible to have selective print out of all the available data of the meter. The user need not revert back to the supplier of the software for modifying the software in case of change in print out data eg. TOD, ABT, Tamper and other data are required.
- ix)** It is very important that the BCS has the feature to export the available data to ASCII and XML or spread sheet format for integrating with the UPPCL billing system taking into account the ABT and TOD features.
- x)** Meter manufacturer should also provide user manual of BCS (basic computer software) i.e. software for dumping of MRI data and convert into format desired by UPSLDC for uploading in EASS server.
- xi)** The BCS shall have a multilevel 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 password should be user definable.
- xii)** Any deviation of readings of main and check meter, beyond a prescribed limit as defined by the user, shall be clearly indicated on priority by the application software.
- xiii)** The BCS software shall also allow computing the net energy, i.e. the difference of import and export energy during the desired billing cycle.
 - BCS software shall be installed and a copy in the form of Compact Disk shall be provided to the respective consignees and as well as to SLDC, UPPTCL.
 - Compatible MRI software for reading the supplier's meters shall also be supplied in the form of Compact Disk to the respective consignees.
- xiv)** Meter manufacturer shall provide the appropriate conversion software for conversion of MRI files to format (AS0) which are compatible with EASS (energy accounting & settlement system) software of UPSLDC.

Note: Desired format will be provided to successful bidder by the UPPTCL.
- xv)** MRI data of meters must be compatible with EASS (energy accounting & settlement system) software of UPSLDC in current as well as in future, which means technical support should be always available when regulatory commission changes regulations and meter manufacturer changes in meter version and software.

TECHNICAL SPECIFICATION OF METER POLLING SOFTWARE

(Not under the scope of Supply)

Data Connectivity Requirement

The Energy Meters procured by UPPTCL and commissioned at most of the interface points are of 0.2s accuracy class, ABT Compliant electronic energy mounted in rack/panel arrangement. Each metering rack/panel provides at least three communication ports: (a) One Galvanically isolated RS232C serial port (b) Two Optically isolated RS232C serial ports/optical ports for local/remote data transfer. UPPTCL has envisaged implementing the scheme for Real time data transfer as well as on-demand data transfer from these meters. Real time data transfer would be used primarily for monitoring (of energy generation/drawl and other relevant parameters in view of ABT application) at the central station. Further, on-demand data transfer will be used for reading the meter (load, frequency, voltage profiles etc.) on a periodic basis as required (say monthly/fortnightly/weekly/daily) for energy accounting and settlement application. The bidder shall be responsible for setting up separate channels for real time data transfer and on-demand data transfer from all these meters using suitable multiplexers / converters and communication cables at each location [One RS232 serial port shall be used for on-demand remote communication and other RS485 serial ports shall be used for real time data transfer. These communication ports shall thus be used for setting up independent channels for on-line and on-demand data transfer]. These ports shall be capable of Data transfer to a remote computer over suitable communication media (GPRS/leased line/OFC) using suitable communication hardware (modems/multiplexer/communication cables etc.) as required for proper functioning of remote meter reading scheme. Integration of metering system with these communication mediums shall be the responsibility of the bidder.

Base Computer Software has been supplied by meter manufacturer for on-demand remote communication of data from these meters using PSTN network at present. UPPTCL shall use the above mentioned communication media (GPRS/leased line/OFC) for on-line real time data collection from energy meters. Suitable software for on-line monitoring and on demand data collection using the above communication medium shall be provided by the bidder. Integration of meters and the above communication medium will require physical interconnection between the communication medium and metering systems (having RS232, RS485 serial port outputs) as well as implementation of the suitable comprehensive single software for on-line and on-demand data transfer on the above mentioned communication channel(s). The instantaneous parameters (data) from each energy meter shall be retrieved at central site at least once in five (5) minutes. However, flexibility shall be provided to UPPTCL to increase or decrease the polling cycle time as per requirements in future.

Instantaneous real-time data from each energy meter shall be made available to UPPTCL in ASCII & XML formats also. The exact format (may change from time to time), in which UPPTCL shall require data, will be provided to successful Bidder.

Primarily, the meter data includes, but not limited to, following:

- a) Real-time Data Transfer: Instantaneous parameters to be polled once in five (5) minutes (Note: Option of “parameter selection” by the User may be provided from given superset of parameters):
 - (i) Active Import
 - (ii) Active Export
 - (iii) Reactive Lag while active import
 - (iv) Reactive Lead while active import
 - (v) Reactive Lag while active export
 - (vi) Reactive Lead while active export

- (vii) Apparent Import
- (viii) Apparent Export
- (ix) Reactive High
- (x) Reactive Low
- (xi) Average Frequency (Hz)
- (xii) Average RMS Voltage
- (xiii) Meter Time-stamp (Date - “DD MM YY” and Time - “hh mm ss”)

It should be possible to monitor energy and/or demand data for parameters as specified at Sr. Nos. (i) to (x) above.

b) On-demand Data Transfer: Load survey parameters (stored in meter memory in block of **15 / 5 -minutes** for at least 65 days) to be polled once in a month / once in a fortnight / once in a week. Facility shall be provided to poll all meters automatically (without any human intervention) depending upon the User defined sequence of meter serial numbers:

- (i) Watt (Import)
- (ii) Watt (Export)
- (iii) Volt Ampere Reactive (Lag) when Watt Hour (Import)
- (iv) Volt Ampere Reactive (Lead) when Watt Hour (Import)
- (v) Volt Ampere Reactive (Lag) when Watt Hour (Export)
- (vi) Volt Ampere Reactive (Lead) when Watt Hour (Export)
- (vii) Average Frequency (Hz)
- (viii) Average RMS Voltage (kV)
- (ix) Voltage Low
- (x) Time Retard
- (xi) Time Advance

TESTING AND TEST PROCEDURES

The offered meter should be fully type tested as per IS:14697. The Bidders shall have to submit the detailed type test report.

Sl. No	Type Tests	Acceptance	Routine	Sub Clause
A	Type Tests For Meters			
1	Tests Of Insulation Properties	-	-	5.4.6
	Impulse Voltage Test	-	-	5.4.6.2
	A.C. Voltage Test	Yes	Yes	5.6.3
	Insulation Resistance Test	Yes	Yes	5.6.4
2	Tests Of Accuracy Requirements	-	-	5.6
	Tests On Limits Of Error	Yes	Yes	5.6.8
	Test Of Meter Constant (If Applicable)	Yes	Yes	5.6.6
	Test Of Starting Condition	Yes	Yes	5.6.5
	Test Of No Load Condition	Yes	-	5.6.4
	Repeatability Of Error Test	Yes	-	5.6.9
	Test Of Ambient Temp. Influence	-	-	5.6.3
	Test Of Influence Quantities	-	-	5.6.2
	Measurement Of Phase Current	-	-	6.6.2(Refer Note)*
3	Test Of Electrical Requirements	-	-	5.4
	Test Of Power Consumption	Yes	-	5.4.1
	Test Of Influence Of Supply Voltage	-	-	-
	Test Of Influence Of Short Time Over currents	-	-	5.4.2
	Test Of Influence Of Self Heating	-	-	5.4.4
		-	-	5.4.5
4	Tests For Electromagnetic Compatibility	-	-	5.5
	Radio Interference Measurements	-	-	5.5.5
	Fast Transient Burst Test	-	-	5.5.4
	Test Of Immunity To Electromagnetic HF Fields.	-	-	5.5.3
	Test For Immunity To Electrostatic Discharge	-	-	-
5	Tests Of Climatic Influences	-	-	5.3
	Dry Heat Test	-	-	5.3.1
	Cold Test	-	-	5.3.2
	Damp Heat, Cycle Test	-	-	-
6	Tests Of Mechanical Requirements	Yes	-	5.2
	Vibration Test	Yes	-	5.2.3
	Shock Test	-	-	5.2.2
	Spring Hammer Test	-	-	-
	Test Of Protection Against Penetration Of Dust And Water	-	-	5.2.1
	Test Of Resistance to Heat And Fire	-	-	5.2.5
		-	-	5.2.4

Notes:

1. For type testing all the above tests are to be carried out except test 2.8 for which refer note 2.
2. *However, test 2.8 is valid only for meters having additional features as per clause 6.6 (Of CBIP Recommendations), which, in this case, is not applicable

11.1 If desired by the purchaser, one (1) out of the ordered quantity of meters may be subjected to the complete range of type tests as per CBIP recommendations and IEC-687 1992-06(Second Edition), after final assembly. In case of any failure to pass all specified tests, the contractor shall arrange to carry out the requisite modifications/replacements in the entire lot of meters at his own cost. After any such modifications and final assembly, two (2) meters selected out of the lot by the owner's representative shall be subjected to the full range of type tests. The manufacturer shall further commence manufacturing only after these are successfully tested.

11.2 ACCEPTANCE & ROUTINE TESTS

11.2.1 ACCEPTANCE TESTS

All acceptance tests as stipulated in the relevant standards shall be carried out by the supplier in the presence of purchaser's representative.

Following additional tests shall be carried out on meters as per procedures of CBIP Technical Report 88 on randomly selected samples.

- i) Shock Test
- ii) Vibration Test
- iii) Magnetic Induction of external origin (AC & DC)
- iv) Tamper & Fraud Protection as per clause 6.0
- v) High Voltage test on Metering Cubicles.

11.2.2 ROUTINE TESTS

All routine tests as stipulated in the relevant standards shall be carried out. In addition, the following tests including tamper and fraud protection tests shall also be carried out and such routine test certificates shall be submitted for approval of the purchaser.

- i) Display of all metering parameters.
- ii) Remote communication capabilities.
- iii) Data downloading through MRI.