TECHNICAL SPECIFICATIONS FOR SUPPLY, ERECTION, TESTING AND COMMISSIONING OF MICROPROCESSOR BASED 0.2S ACCURACY CLASS ABT COMPLIANT AND HT TARIFF COMPLIANT STATIC METERING SYSTEM SUITABLE FOR CAPTIVE POWER PLANTS (CPP), ITS RECIPIENT USERS, INDEPENDENT POWER PRODUCERS (IPP)/GENERATORS AND INTER UTILITY ENERGY EXCHANGE.

PART - I

Specifications for high precision 3 vector energy meters for Frequency linked ABT tariff, HT tariff (energy/demand) and energy audit/load survey purpose.

1. SCOPE:

This specification covers high precision three vector static energy meters of accuracy class **(I) 0.2S for both Active and Reactive part of measurement for 1 Amp** (all OA Users connected on 66KV and above) OR **(II) 0.2S for both Active and Reactive part of measurement for 5 Amp** (all OA Users connected on below 66KV system) meters capable of performing functions of energy audit / load survey and metering for Frequency Linked ABT tariff as well as applicable HT/EHT consumers tariff purposes. The meters shall be three phase 4-wire type for HT applications.

The metering system should be featured specifically for application of combination of two very different tariffs simultaneously in the same meter. As per GETCO/PGVCL requirement, the system should be capable of measuring, recording and storing all required billing, history, tamper and load survey parameters in Import mode and in Export mode.

These specifications are to provide an integrated metering system for electrical energy measurement at the bulk supply point. The fundamental (overall) accuracy of the measurement system is better than 0.5%, i.e. Class of accuracy-0.2**S** as per IS-14697, (Class-0.2S for Active part and Class-0.2S for Reactive part) which includes and compensates the measurement uncertainties caused by the Current and Voltage transformers, control cables etc which are already commissioned at the point of measurement and may not necessarily confirm to accuracy Class 0.1 or Class 0.2.
The proposed package covers the design, engineering, manufacture, assembly, inspection and testing before supply and delivery at site/FOR destination and successful commissioning of CT and VT operated microprocessor based integrated 3-phase 4-wire metering system with 0.2**S** accuracy class energy meters and metering cubicles along with accessories, Meter Reading Instruments and associated Base Computer Software (as detailed in this specification) at bulk, inter-utility power flow points, Independent Power Producers(IPP) and Captive Power plants / producers (CPP). The electricity meters must be installed in a dedicated and secure steel metering cabinet. There shall not be any marshalling box / junction box for the control cables between the CT / VT and this metering cabinet in an attempt to eliminate any measurement uncertainties caused by malicious / Un-intended intention of either / third party. The topology is specifically mentioned here to stress on the **"tamper resistant"** design of the metering cabinet.

The metering equipment should be modular for the ease of maintainability and the design to ensure that if a fault develops, it should be isolate to minimize damage.

2. STANDARD APPLICABLE:

While drafting these specifications, reference has been made to following Indian and International Standard Specifications. In case, certain details are not covered in these specifications, the relevant Indian/International Standard shall be applicable.

IEC 62053-22 - Static watt hour meters - Meteorological specifications for classes--**0.2S AND 0.5S**
IS 14697 (1999) – AC static Transformer operated Watt-hour and VAR-hour meters, Class **0.2S AND 0.5S** specification.
IEC 1036 - Static Energy Meters
IS 9000 - Environmental testing
IS 8161 (Draft) - Impulse wave testing
IS 13010 - AC Watt-hour meters OF Class - 0.5, 1 & 2
IS 12346 - Specification for testing equipment for AC energy meters.
IS 8686 - w.r.t. High frequency disturbance testing
CBIP Report 88 (Revised May-1996 and amended in April-'99 and Sept-'99) - Specification for A.C. Static electrical energy meters.
PFC Spec. - For High precision 3 vector Energy Meter.
CEA Notification Dtd: 17/03/2006 on standard for Operation of meters.

3. SUPPLY SYSTEM:

(I) Solid neutral grounded H.V. and E.H.V. 3 phase, 4 wire 50 Hz. system with CTPT (auxiliary transformers) connected.
(II) Primary voltages: 11, 22, 33, KV
(III) Secondary voltages: Ph-Ph 110v or Ph-N 110V/√3. PTs are normally Y-Y (star- star) connected having a secondary Y (star) point brought out or kept floated however Star point NOT earthed.

(a) Primary current: 5 amps to 1000 amps.
(b) Secondary current: 5 amps.

CTs are 1-phase, 3 nos with 6 wire connections to measure balanced and Unbalanced (either Delta or Star connected with floating star point or star point neutral grounded) loads from installation charging (i.e. No load) to 150% of declared rated loads at all power factors.

4. SYSTEM VARIATIONS:

The electrical quantities are required to be measured with a fine degree of precision, (through solid state micro processor, same should have minimum sampling rates of 3000 samples per second for accurate measurement of contents of relevant current and voltage waves) monitor, display and store in non-volatile memory of high precision static demand

and energy Trivectormeters of **0.2S/ 0.5S** class accuracy for energy audit, load survey and tariff metering purposes at the installation of HT consumers, conforming to latest I.E.C-- 62053, CBIP Report-88 and IS-14697 and operated through auxiliary transformers, (conventional version of 3 phase, 4 wire Trivectormeter) These meters are required to function accurately within the specified limits of errors under the following conditions of voltage, frequency, current and temperature.

(a) Electrical Quantities:

i) Voltage

a)	Phase to phase with star connection (but Neutral either solidly grounded or floated)	110 volts + 10% -30%
b)	Phase to star point having neutral point either solidly grounded or floated.	110/ _/3 volts + 20% -30%

ii) Currents.:-- 1 or 5 ampere normal (In) and 0.01 In to 1.2 In working

iii) Frequency: -- 50 Hz. (+) 5% to (--) 5%

(b) Range of Temperature variations :--

SR. NO.	PERTICULARS	SPECIFIED REQUIREMENTS
1	LOCATIONS	AT VARIOUS HT CONNECTIONS IN THE STATE OF GUJARAT
2	MAX. AMBIENT AIR TEMPERATURE	55 Deg. Centigrade
3	MAX. AMBIENT AIR TEMPERATURE IN CLOSED BOX	60 TO 65 Deg.Centigrade
4	MINIMUM AIR TEMPERATURE	6 Deg. Centigrade
5	AVERAGE DAILY AMBIENT TEMPERATURE	30 TO 35 Deg. Centigrade
6	MAX. RTELATIVE HUMIDITY	95 %
7	MAX. ALTITUDE ABOVE MEAN SEA LEVEL	1000 METERS
8	AVERAGE ANNUAL RAIN FALL	700 TO 900 MM
9	MAX. WIND PRESSURE	200 Kg/Sq. MM

(c) MARKING OF METER:

The marking on every meter shall be in accordance with IS 14697/IEC 62053. The Serial Number of the meter must be as per the approval of PGVCL only so that the meter data could be integrated with SLDC software if required.

The basic marking on the meter name plate shall be as follows:

i) Manufacturer's name and trade mark.
ii) Type Designation
iii) BIS mark

iv) Number of phases and wires
v) Serial number
vi) Month & year of manufacture
vii) Reference voltage/ PT ratio
viii) Rated secondary current of CT (-/1 or -/5 A).
ix) Principal unit(s) of measurement.
x) Meter constant (impulse/kWh).
xi) Class index of meter for active and reactive part.
xii) Property of – " ----- "

5. SAMPLING RATE AND DERIVATION OF BASIC MEASURABLE QUANTITIES.

The actual supply wave of related voltages and currents should be sampled out at the rate of minimum 3000 samples per second and should provide integrated values of each actual voltage and current cycle while deriving actual basic Active (cosine part measurable component) and Reactive (sine part measurable component) energies (with respect to relevant voltage wave and current wave) to assess actual contents of energies persisting / traversing, to have up to-date information for total energy even when highest order of Harmonics is present in supply wave.

The meter should have internal Real Time Clock with the back up of a Lithium maintenance free battery of minimum life of Ten (10) years for operation of the time clock. The Real Time Clock shall be based on Quartz crystal timer so as to make it independent of line frequency variations.

6. QUANTITIES TO BE MEASURED, MONITORED AND MEMORISED:

[A] The meters shall be capable of measuring and storing in the memory and displaying the following electrical quantities on meters as well as on data summator/controller (in case of multiple feeders) within specified limits of error for poly phase supplies (i.e. 3-phase, 4 wire system with star point (neutral) solidly grounded or floated) of 3 phase Delta or Star connected load having a floating or a grounded Star point with balanced or unbalanced loads at all power factors. Apparent demand and energy should be derived from active energy (CO-sine part recording arrangement) and reactive energy (sine part lagging power factor recording arrangement) through vector summation of Active energy and only lagging Reactive electrical energies traversed for 15 minutes integration period and billing period.

The meters shall also be capable of measuring, monitoring and storing in the memory minimum four (4) zones of time of day electrical quantities for pre-specified periods of the day and the meter's memory storing capability should be minimum for 35 days with 15 minutes integration period.

[B] Memory of Meter :

The meter shall have a non-volatile memory for storing minimum following parameters automatically for each 15 minutes successive integration block for the period of minimum 35 days , so that in event of failure / damage of the meter the last reading of billing quantities must not be lost.

(1) Cumulative Total Active energy Import

(2) Cumulative Total Active energy Export
(3) Average system Frequency
(4) Cumulative Reactive energy Lag while active import
(5) Cumulative Reactive energy Lead while active import
(6) Cumulative Reactive energy Lag while active export
(7) Cumulative Reactive energy Lead while active export

[C] General Measurement requirements :

- The meters shall be suitable for being connected directly through its terminal block. The metering system must normally draw functional power from aux power supply source in order to avoid over burden on VT sec ckt but in event of failure of aux. supply, it should automatically change over to VT supply.
- Meters shall be suitable for working under balanced / unbalanced loads at all power factor i.e. Zero lag-Unity-Zero lead.
- The meter shall count the number of cycles in PT output during each successive 15 minute block and divide the same by 900 to arrive at the average frequency.
- The meter shall also compute the reactive power on 3-phase, 4-wire principle, with an accuracy of Class-0.2S for 1 Amp meters and for 5 Amp meters as per relevant standards, and integrate the reactive energy 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 and cumulative reactive energy readings of the two registers shall be displayed on demand. The reactive energy shall also be stored in four different registers of meter memory as Reactive import while active import, Reactive import while active export, Reactive export while active import, Reactive export while active export. Cumulative energy registers of the same shall be made available on display as well as BCS.
- The meter shall also store the apparent energy (import and export) and cumulative energy registers of the same shall be made available on display as well as BCS. All apparent energy and demand referred under this specification shall be computed from Total Active energy and Reactive lag energy separately for Import and Export mode.
- The meters shall be compatible with Frequency linked Availability Based Tariff (ABT) as well as TOD tariffs. For TOD tariff, meter shall have the provision to define minimum 4 TOD registers for different energies.
- The meters shall be able to measure and display parameters like instantaneous phase wise voltages, instantaneous line currents, and instantaneous average three phase power factor, average frequency and time.
- Each meter shall have a test output device (visual) for checking the accuracy of active energy measurement. Optionally it shall be possible to switch over the test output device to reactive energy via suitable means.
- The meter display shall be of dot matrix format Alpha numeric LCD type with backlit. Each meter shall either have its own display unit or a common display for all the meters housed in one enclosure to be provided for conveniently accessing all the metering data using soft keypad. Necessary means shall be provided for moving forward/backward from one display to the other.

- The meters shall normally operate with the power drawn through the auxiliary power supply. An automatic backup for continued operation of the meter's RTC and calendar-clock, and for retaining all data stored in its memory, shall be provided through a long life Lithium battery, which shall be capable of supplying the required power for at least two years in absence of power. 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.
- The design should enable the auxiliary supply to be switched automatically between the AC and DC voltage, depending upon, which is available. Typically auxiliary voltages available are 110V DC and 220V DC to power up the unit. The system shall have a provision for power supply back up and shall continue to work even if any one of the above are present. No data loss shall take place between supply change over and supply failure events shall also be logged.
- Each meter shall have a built in calendar and clock, having an accuracy of 1 minute per month or better. The calendar and clock shall be correctly set at the manufacturer's works. Clock adjustment shall be possible at site using Hand Held Data collection device protected through authenticated password.
- 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 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.
- 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 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.

7. DISPLAY:

The meter should have legible LCD with backlit / LED eight (6+2 decimal) digit automatic in cyclic order display. In case a single display is being used to display the values of various parameters in rotation, it should be possible to display continuously in a specified cyclic order. Each of the physical quantities shall remain on the display screen for a time interval of minimum seven seconds with latitude of one second on either side, which should be programmable. While displaying the memories, proper and adequate legible and understandable text identification of each of the quantities being displayed shall be made (like 24 hours, night period, morning peak, evening peak period, and TOD parameters etc.).
All the following quantities or required/selected display parameters out of following quantities shall be displayed continuously in a specific cyclic order with a gap of two to three minutes (to be specified by the manufacturer) between two successive cycles.

Sequence	**Name of Parameters**
1	**LCD display test**
2	Instantaneous R - Phase voltage and current.

3	Instantaneous Y - Phase voltage and current.
4	Instantaneous B - Phase voltage and current.
5	Instantaneous Line frequency in Hz or CpS.
6	Phase sequence for Voltage and Current
7	Instantaneous total Active power. KW - Import/Export
8	Instantaneous power factor.
9	RTC – date and time.
10	Rising demand in KVA - Import/Export with Elapsed time
	Cumulative energies from the date of installation - sum of all tariffs.
11	Cumulative 24 Hours Forward Total Export KWH (fundamental + harmonics).
12	Cumulative 24 Hours Export KVARH lag (With respect to export KWH).
13	Cumulative 24 Hours Export KVARH lead (With respect to export KWH)
14	Cumulative 24 Hours Export KVAH derived from vectorial summation of Total (i.e. Fundamental+Harmonics) Active export and Reactive (lag only) energy.
15	Cumulative Forward Export KWH (fundamental + harmonics).for Peak Hours
16	Cumulative Forward Export KWH (fundamental + harmonics).for Night Hours
17	Cumulative Export KVARH lag (With respect to export KWH).for Peak Hours
18	Cumulative Export KVARH lag (With respect to export KWH).for Night Hours
19	Cumulative Export KVARH lag (With respect to export KWH).for Rest Hours
20	Present KVA MD of current billing period –i.e. KVA-MD - Import/Export recorded during 24 Hours from the date of last MD-Resetting to date of visit /reading.
21	KVA-MD - Import/Export of last billing period- i.e. Billing MD of 24 Hours recorded between last two Resets.
22	Cumulative KVA-MD - Import/Export i.e. total of 24 Hours Bill MD accumulated on every reset
23	No. of MD Reset counts.
24	Average Frequency of Last 15 minutes Integration Period Block
25	Total KWh Import of last 15 minutes Integration Period Block
26	Total KWh Export of last 15 minutes Integration Period Block
27	Cumulative Reactive energy during High voltage condition
28	Cumulative Reactive energy during Low voltage condition
	TAMPER DATA INFORMATION
29	Present Tamper status for following events : • Voltage Failure Count (Phase wise) • Current Failure count (Phase wise) • Voltage unbalance (Phase wise) • Current Unbalance (Phase wise) • Current Reversal (Phase wise)
30	First Occurrence of tamper

31	First Occurrence tamper date and time
32	Last Occurrence of tamper
33	Last Occurrence tamper date and time
34	Last Restored tamper
35	Last Restored tamper date and time
36	Nos. of total communication counts
37	Total nos of tamper counts
38	Cumulative 24 Hours Forward Export KWH fundamental (Pure sine wave) from the date of installation.
39	Cumulative Total (Fundamental + Harmonics) KWh **Import** from the date of installation.
40	Cumulative Fundamental (Pure Sine wave) KWh **Import** from the date of installation.
Sequence	**Name of Parameters**
41	Cumulative Forward Export KWH (fundamental + harmonics). for Rest Hours
42	Cumulative Export KVAH - Import/Export derived from vectorial summation of Active import/export and Reactive (lag only) energy w.r.to respective active energy for Peak Hours
43	Cumulative Export KVAH - Import/Export derived from vectorial summation of Active import/export and Reactive (lag only) energy w.r.to respective active energy for Night Hours
44	Cumulative Export KVAH - Import/Export derived from vectorial summation of Active import/export and Reactive (lag only) energy w.r.to respective active energy for Rest Hours
45	KVA-MD –Import/Export of last Billing period for Peak Hours
46	KVA-MD –Import/Export of last Billing period for Night Hours
47	KVA-MD –Import/Export of last Billing period for Rest Hours
48	KVA-MD –Import/Export of Current Billing period for Peak Hours
49	KVA-MD –Import/Export of Current Billing period for Night Hours
50	KVA-MD –Import/Export of Current Billing period for Rest Hours
51	Meter CT Ratio & PT Ratio
52	Total Nos.of Hours that Meter was powered **"ON"**
53	Meter's Constant- i.e. Pulses/Kwh and Pulses / KVARh

Separate High Resolution registers for testing purpose.

Sequence	**Name of Parameters**
1	High Resolution Register for Cumulative KWh energy –Import/Export.
2	High Resolution Register for KVARh Lag and Lead-separately and for –Import/Export mode.

8. COMMUNICATION INSTRUCTION STORING CAPABILITY:

Meter shall be capable of receiving the following instructions/information from the Base Computer Service Center either directly or through meter reading instrument.i.e. Common

Meter Reading Instrument-CMRI, only after due authentication through protected pass word from base computer and shall be able to store in its non-volatile memory and shall obey / carry out instructions for accurate measurement of relevant electrical quantities.

The meter should have galvanically isolated communication port so that it can be easily connected to a hand-held meter reading instrument for Data transfer or subsequently hooked to remote metering instrument such as modem etc. The meter should be capable of executing instructions from base computer service center only after due authentication through protected password, for the following.

i) Change in integration period
ii) Change in automatic MD re-setting date & time.
iii) Modifications in TOD timings

The meter should thereafter communicate above information while off-loading the data to computer through hand-held meter reading instrument and by RS485 serial port to PC relevant energy audit/load survey data.

The meter shall carry out all functions as per pre-set instructions and thereafter shall be able to transfer the same to base computer service center directly or via meter reading instrument i.e. CMRI with relevant billing datas or energy audit / load survey data.

The meter should also have RS232/RS485 Serial port for (i) connecting the same with suitable GSM MODEM for communication with the remote center and for (ii) retrieval / polling out the metered with the help of computer with required software and (iii) connecting communication set up for ON Line monitoring through suitable software if required.

9. MAXIMUM DEMAND REGISTER:

The meter should monitor demand during pre-specified integration period set and record/display the maximum registered value. The rising demand under the current integration period should be displayed along with elapsed time. The integration period shall be capable of making adjustment with duration of 15 minutes as required by the provisions of tariff schedule. The adjustment option shall be available and it should be possible to select the period of integration by the user after duly authenticated through base computer service center only.

Note:-

1. **Wherever Kwh register is specified, the same shall be Total Kwh (Fundamental + Harmonics).**
2. **Wherever KVAh register is specified, the same shall be from vectorial summation of Total Kwh (funda + Harm) & Lagging KVARh of respective mode.**

10. MAXIMUM DEMAND RESET:

The meter should have the following maximum demand resetting arrangements:

(a) Automatic resetting at the end of pre-specified period or on a pre-specified date and time of every calendar month (e.g. 00.00 hours on 21st day of every month).

(b) A provision for revising the resetting cycle for modifying the date and time of automatic resetting through base computer service center or via hand-held meter reading instrument only after using protected pass word, i.e. CMRI specified here under, should be available.

(c) Provision for Manual Resetting of the monthly Max Demand with adequate sealing arrangement must also be made

11. ENERGY AUDIT/LOAD SURVEY CAPABILITY:

The meter should be capable of storing in its non-volatile memory the following parameters for each 15 minutes integration period block continuously for the recent past minimum 35 days (minimum 1 billing period). Bidders should clearly indicate in their bids the maximum memory storing capabilities in terms of Nos. of days for storing of following quantities.

(A) Fixed Parameters / information: - Must be kept recorded permanently

(i) Meter - make and Sr. No.
(ii) prevailing integration period
(iii) automatic re setting date and time
(iv) Meter's constant. i.e. Nos of pulses per unit OR Nos of units per pulses

(B) Variable parameters / information: - Minimum for 35 days

(i) Active energy: Total Kwh/Mwh Import and Export for last billing period. and Total Kwh/Mwh Export for current billing period.

(ii) Reactive energy : KVARH/MVARH lagging with respect to Import and Export of active energy (I) For last billing period. & (II) For current billing period.

(iii) Apparent energy: KVAH/MVAHImport and Export derived vectorially from lagging reactive and Total active energy (I) For last billing period & (II)For current billing period.

(iv) Average Frequency: The meter should record average system frequency for each 15 minutes integration period.

The load survey data must be available minimum for last 35 Nos. of days during each integration period in FIFO manner (First In First Out) and all tamper data separately for each event shall be made available with its time of first occurrence and time of last restoration with total duration period and in NO case shall be facilitated to Reset to ZERO. (i.e. FIFO or in rotational/roll over method). The bidder must also specify Nos. of tamper events that the meter is capable to store.

However the meter must provide Summary Report for all total Nos of tamper events and total duration (for each type) for the events occurred from the date of manufacturing or installation.

It should be possible to retrieve these data via communication port on to hand-held meter reading instrument-CMRI and it should be possible to off load these data on to IBM compatible computer and get complete details of the load/demand pattern in terms of KW/KWh, KVA/KVAh, and Average Frequency both in numeric data form and in graphic form for all the 24 hours a day divided as per the pre-set integration period of 15 minutes in each individual case. Necessary software for this purpose must be provided by the supplier.

The total time in minutes to be taken by meter for retrieval of all above data shall have to be clearly indicated in offer.

12. TIME OF DAY TARIFF/DEMAND:

The meter shall be capable to register demand and energy consumption minimum for four different zones in a 24 hours' cycle to record time of day consumptions. It should be possible to change the time of day period for these registers through base computer service center directly or via hand-held meter reading instrument-CMRI only after due authentication through protected password from base computer. The meter should be able to record active energy consumptions for minimum four specified time of day to help application of proper tariff.

13. HARMONIC MEASUREMENTS:

The meter should be capable to measure 50 Hz (pure sine wave) energy and total energy of 50 Hz **+** harmonic energy. This will help in estimation of harmonic contents in supply system at various points.

14. DATA TRANSFER AND METER READING INSTRUMENT:

The meter reading instrument shall be compact and portable with (rechargeable) battery powered. It should be capable to cover the data from various energy meters and transfer them in minimum time (to be specified by the bidder) on to IBM compatible PC XT or AT. The software should be user friendly. The data transfer should be reliable and fraud proof. The computer software should give all the details required for billing and energy audit/load survey.

The meter condition details should also be transferred to computer through hand held meter reading instrument. The Meter Reading Instrument should have following characteristics.

Meter Reading Instrument shall be capable to retrieve only billing data (One way communication) from energy meter and capable to transfer the same to base computer service center for immediate issue of bill.

15. CONSTRUCTION OF THE METER:

a) The meter must be properly shielded from the adverse effect of external AC and DC magnetic influence.

b) The Current Transformers / Current Sensors provided inside the meter for measurement purpose shall have to be shielded with the help of MS sheet casing for protection against the adverse effect of external AC and DC magnetic influence.

c) The meter shall confirm the degree of protection IP 51.

The meter should not get damaged or influenced by the electromagnetic disturbances and electrostatic discharges caused by Harmonics, Voltage dips, short interruptions, conducted transients, AC and DC magnetic field.

16. SEALING OF METER:

Proper sealing arrangement should be provided on the meter to make it tamper proof and avoid mishandling by unauthorized persons. At least 2 (two) seals (diagonally) each on the body and the terminal block shall be provided.

17. TAMPER AND FRAUD PROTECTION/INFORMATIONS:

The meter should have the following special features to prevent/detect different ways of tamper and fraud.

(a) Potential phase sequence: Meter should measure/monitor phase rotation and store all variable electrical quantities (active and reactive both) irrespective of rotation of potential phase sequence (i.e. either clockwise or anti-clockwise) accurately within the specified limits of errors.

(b) Potentials/line voltage: (I) Indication of missing of voltages and/or (II) partial potential reflected due to missing of primary potentials) i.e. difference more than 30% between phase to Phase(line) potential with date, time and duration stamped specifying appropriate phase affected.

(c) Line currents: (I) Indication of missing and/or (II) bye- passing i.e. difference more than 20% in magnitude between relevant phase currents with date, time and duration stamped specifying appropriate phase affected.

(d) Temperature sensor: The temperature sensor should be provided in physical form of assessment i.e temperature indicating stickers to sense highest temperature of meter.

The meter shall be able to check wiring and shall flesh message for Wrong wiring. The meter Phasor Diagram through PC and MRI should also be possible.

18. ACCURACY:

(A) The **0.2s** Class accuracy of active power and reactive power and energy measurements by meter shall be tested in accordance with relevant clause of IEC 62053-22 for **0.2s** class of accuracy static alternating current watt-hour meters for active energy and IS-14697 (latest amendment) for Class 0.2S Active and Reactive static meters. The tests and reference conditions under which tests shall be carried out shall be in accordance with respective clause no. of IEC-62053-22, along with tests and test conditions as envisaged under respective clause no of IEC 62053-22.

(B) VA Burdens of various circuits:

i) Voltage Circuit: The active and apparent power consumption in each voltage circuit including the power supply of metering module at reference voltage, reference

temperature and reference frequency shall not exceed 1 Watt per phase and 0.5 VA per phase respectively.
ii) Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature shall not exceed 1 VA per phase.
iii) Auxiliary power supply i) VA burden to operate auxiliaries of meter.

19. SOFTWARES:

The Following software shall be supplied free of cost by the meter manufacturer. The software should be suitable for the operating system of the associated PGVCL's computers

(I) Software for reading and programming the meter contents in the MRI preferably window base.

(ii) Window Base computer software for accepting data from MRI and down loading instructions from Base Computer to MRI and also for communicating meter through its optical or RS232/RS485 port for down loading all data from the meter to P.C. / Laptop.
(iii) Necessary software for loading applications program via communication port
(iv) The meter should be capable to communicate directly to Lap Top computer. Any other special applications software and additional software not mentioned above but necessary for functioning of the system.
(v) The suitable BCS software for polling metered data from Remote center through GSM/PSTN MODEM.
(vi) The suitable ASCII file format compatible to PGVCL billing software shall be provided for automatic billing of consumer.

20.0 TECHNICAL EVALUATION

The following documents must invariably be submitted along with the offer.
(a) All Type tests certificates for the tests conducted on Three phase, Four Wire, 1Amp / 5 Amp, Class **-0.2S HT static Trivectormeters** as per relevant Clause of IS-14697 or IEC-62053 and must be certified by Govt Test House or Govt. approved Third party laboratory for the tests, having been conducted within **THREE** years prior to the date of submission of technical offer.
(b) The offer shall be accepted only from the original manufacturers. The manufacturer must be having at least Five years experience of manufacturing and operation of similar type of Trivectormeters.

PART-II
Specification for Automatic Remote Meter Reading System.

Introduction:

Automatic Meter Reading of meters at consumer premises enables effective surveillance and remote metering of all parameters of energy consumption at the consumer end and is particularly useful for industrial and high value consumers where accuracy of billing and timely payment are important. It is important to monitor consumption patterns for such consumers to detect theft and it is possible to do this remotely with Automatic Remote Meter Reading System.

The Remote Metering System consists of a remote unit(s) having telemetering circuit which receives the signals generated by the electronic meters fitted with an **external or internal built** in **Modem** at the consumer's premises. The remote units are connected to the control station through a dedicated communication link which should be Mobile link, i.e. GSM MODEM. Such communication system between the meter and the PGVCL control center through the remote metering system makes it easier for the center to retrieve/poll data relating to billing data, load survey data, tamper data, snap shot of instantaneous data and energy consumed as recorded by the meter.

Scope of supply:

The required system shall comprise of following:

1. Built in GSM MODEM or External GSM MODEM.
2. GSM MODEM each to be supplied at:-
   - ✓ Consumer Meter Unit
   - ✓ Master information center (MIC) – Located at respective office of PGVCL
   - ✓ Divisional information Center (DIC) – Located at PGVCL Division Office.
   - ✓ Meter to be hooked / connected directly to MIC-DIC through suitable GSM media.
3. Appropriate Software as described under relevant clause of tender specification at above locations described herein above.
4. The meter must have RS232 serial port for connection of external MODEM for communication system.

The AMR system shall be required to:

(i) Down load all relevant data from the meter (CMU) installed at consumer premises.

(ii)Transform the data into signals suitable for transmission through the selected communication media – GSM / PSTN.

(iii) Transmit it to the above information centers of PGVCL.

(iv) Transform the data into a format suitable for report generation, invoicing control from the computer system at any of above information centers. Also shall transform the data into a format suitable for management information, load monitoring, load surveying, evaluation of tamper attempts etc.

2. SCOPE:-

The scope shall be complete including the center required/specified by PGVCL with various functional levels covering design, manufacture, testing, delivery, transport, storage, installation and commissioning & 5 (FIVE) year guarantee of the AMR system. The supplier must also have commissioned more than 250 Nos. of such Remote Meter reading units and should be working satisfactorily. The certificate from the user in this regard must be submitted with offer.

3. General Requirements:-

(i) The system must have security features to prevent any access by unauthorized personnel to the data, hardware & software.

(ii) The system must have security features for restricting PGVCL personnel from performing activities which are not within their authorization.

(iii) The communication links between CMU & PGVCLs various information centers must be fully encrypted as per relevant Data Encryption Standards (DES).

(iv) Security of Data in transit must be provided by using standard protocols, Error detection and correction protocols & security measures.

(v) The system must be able to work under the following environmental conditions.

a)	Temperature	-10 degree C to 65º C
b)	Humidity	2% RH to 95% RH Non Condensing
c)	System Voltage	3 x 63.5 V / 3 x 110 V
d)	System Frequency	50 Hz + 5%
e)	Influence Quantities	CBIP-88 (Revised July-96) & IS-14697

(vi) The system must have adequate redundancy & archival capabilities.

4. Consumer Meter Unit (CMU) :-

The CMUs intended for Remote Communication will be equipped with features to answer a Remote Request for Meter Reading. The CMUs shall also be programmable to answer to Remote Request in all specified time slot i.e. meter shall be required to answer during any time i.e. 24 hrs.

The CMU shall

(a) be able to call back PGVCL's Information centers to dump the reading into the computer system, in any time slot specified by PGVCL.

(b) be provided with indication/display that Remote communication is in progress.

(c) Have a RTC & calendar in the meter and shall continue to maintain the clock & calendar even when power is out.

(d) Be provided the requisite facilities to acknowledge the receipt of command.

(e) The meter data can be retrieved by any of the Collection centers including the Central station computer remotely through the suitable modem viz. GSM Modem network by just dialing the phone number of the meter and specifying the information to be retrieved.

(f) Collect data as per time interval defined by the user. The user can change the interval as and when required. The change should be sent to the Communicator Box as an SMS or data call.

(g) Collect data from energy meter using optical port or RS232 or RS485 port of the meter.
(h) The user can also send query to the box and collect the necessary data.
(i) The data collected should be encrypted so that no external interference can affect the security of the data. The manipulation with the data collection is not possible.
(j) All the parameters, instantaneous, billing, tamper and load survey parameters listed under **Part-I** shall be available by Remote interrogations from the information center.
The information center should be able to dial up the meter at any point of time to retrieve / down load all metered date including load survey and tamper data through the base / information center P. C. software.

5. Communication Interface

The remote communication shall be over RS232 / RS485 interface.

- The supplier shall have to supply all information center base computer software free cost. Any software used in interface unit and base computer must be dully validated and tested by Govt. Lab. The certificate in this regard must be submitted with offer, failing which the offer will not be considered.
- The Base Computer Software (BCS) in case of Data collection centers described as above shall be featured for Auto Scheduling for polling and interrogation of any data from the CMU automatically at pre defined / required time of the day (i.e. Programmable)
  - The user can also send query to the box and collect the necessary data.
  - The data collected should be encrypted so that no external interference can affect the security of the data. The manipulation with the data collection is not possible.

5. Modem

The Modem shall be used at the consumer meter terminals and at the PGVCL's Information centers for transforming the signal and transmitting through the selected medium. A standard Hayes compatible Modem shall be used for communication. The Modem shall :

(i) Have connector interface to RS232/RS485
(ii) Work in dial up/polling mode.
(iii) Have auto dial/polling, redial, dial linking, call status display, auto parity and data rate selection and non-volatile memory for Modem option parameters.
(iv) Support serial binary and asynchronous data format for data transfer.
(v) Have a facility of error correction as per Microcom Network Protocol (MNP) Clause No:3, 4, and 5
(vi) Have a rechargeable battery back up.
(vii) Shall not be susceptible to electromagnetic and other interference from nearby monitors and power supplies.
(viii) Have data compression facility as per MNP or CCIT standard.
(ix) Have command buffer of minimum 40 characters.
(x) Have LCD indications for transmitting data, receiving data, off hook etc.
(xi) Have adjustable data rate.

The Modem in case of external MODEM, once installed shall be enclosed by the sealable terminal cover thereby preventing any access to the Modem and the cables once the terminal cover is sealed.

In the present power scenario it is preferred to use only GSM type Modem so as to avoid any access for the consumer to fiddle with the metering and thereby protecting revenue.

Base Computer Software (BCS):
The data from various sites should be collected manually or automatically at information center on a PC/server. The PC/server will have GSM connectivity and it will collect data from various meters.

Features of data collecting software:
1. Data collection:

a. The software should have facility to dial a particular meter or group of meters and collect data as and when required. The user can also set a time at which it should dial and collect data automatically.
b. The user can collect all data or specific data from the meter.
c. The data collected can be evaluated for analysis of load pattern, tamper attempts/events or other consumer related activities.

2. Reports

a. Reports should be generated as per the requirement of PGVCL. The PGVCL shall provide details of formats and specifications for the required reports.
b. The software should be user friendly and should be menu driven. It should be easy to generate reports and to get any consumer information.
c. It should l have in-built facility to export data to MS-Excel format.

3 SIM CARD SPECIFICATIONS:
PGVCL will provide SIM cards for IU and also for receiver at control station. These SIM cards should of standard sizes that are used in GSM mobile phones. SIM card should operate on 5V / 10V.

6. Communication System:
The bidder shall offer cellular phone as a communication media, i.e. GSM, which shall ensure reliability of data transmission at a competitive price.