No. RVPN / SE (REMC) / (AUTOMATION) /XEN.1 / D. 109 Jaipur.

To,

All RE-generators, QCA’s and service provider

Sub: - Revised Guideline for integration of New ABT Meter to STOMS Centre.

Please fine enclosed Revised Guideline for integration of New ABT Meter to STOMS Centre for further needful.

Encl: As above

(Himanshu Pandey)
Superintending Engineer (REMC)

Copy submitted/forwarded to the following for information:

1. The Chief Engineer (LD), RVPN, Jaipur.
2. The Web Administrator SLDC website (TA to Chief Engineer (LD), RVPN, Jaipur to please upload the revised guidelines on www.sldc.rajasthan.gov.in.
3. The SE (MIS), RVPN, Jaipur to arrange to upload the revised guideline on www.rvpn.co.in

(25/6/2020)
Superintending Engineer (REMC)
RVVPN has implemented Smart Transmission Operation Management System (STOMS) for implementation of Deviation Settlement Mechanism for various stakeholders as per Regulatory requirements. In this, AMR system along with main Control centre at State Data Centre (with Back-Up Centre at SLDC Heerapura) have been established.

The Rajasthan Electricity Regulatory Commission (RERC) in its order dated 27.09.2019 has mandated to install check meters. Various renewable generators, Licensees and third parties who are mandated to integrate the metering data are also being added regularly to STOMS system for settlement of deviation and other required functions.

In above reference and context, following revised guidelines are being issued for integration of new ABT meters, as check meters, to STOMS system.

A. Guideline specification of main items

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Item Particular</th>
<th>Description/Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABT meter</td>
<td>As per latest RVVPN ABT meter specification (Appended at Annexure-A). It can be amended time to time as per requirements and the latest shall prevail.</td>
</tr>
<tr>
<td>2</td>
<td>Data Concentrator Unit (DCU)</td>
<td>Guideline specification adopted by RVVPN under STOMS project (Appended at Annexure-B)</td>
</tr>
<tr>
<td>3</td>
<td>ABT Meter Box (2 Meter/4 Meter)</td>
<td>Sample GA Drawings appended at Annexure-C</td>
</tr>
<tr>
<td>4</td>
<td>Modem</td>
<td>Guideline specification adopted by RVVPN under STOMS project (Appended at Annexure-D)</td>
</tr>
</tbody>
</table>

Amendments/clarifications in above specifications as issued are enclosed at Annexure-E. The necessary suitable DCU/Enclosures/cabling (Power & Networking) shall be as per standard practices and norms.

B. Charges for communication and integration with STOMS

The following procedure and charges shall be carried out for integration with STOMS system:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Item Particular</th>
<th>Procedure and Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GPRS based communication</td>
<td>The stakeholder is required to take Data connectivity from Service providers i.e. Vodafone &amp; Airtel. The consent letter for inclusion of the Data connection in RVVPN of STOMS project shall be given by SLDC. Payment for monthly charges shall be borne by stakeholder</td>
</tr>
<tr>
<td>2</td>
<td>One Time charges for connectivity provision up to Control centre</td>
<td>Rs. 5000/- + applicable GST</td>
</tr>
<tr>
<td>3</td>
<td>Integration Charges for Meter(s) per Bay to STOMS</td>
<td>Year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2020-21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2021-22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2022- upto May-2023</td>
</tr>
<tr>
<td>4</td>
<td>Maintenance charges of integration per Bay to STOMS</td>
<td>Rs. 1500/- + applicable GST per annum (Charges upto May-2023 to be taken while allowing the connectivity)</td>
</tr>
</tbody>
</table>
Note:

1. The above charges at Table B do not include any material cost of items required for integration purpose to STOMS i.e. ABT Meter Box, Ethernet switch, DCU, Modem, Cables etc. The stakeholder shall bear supply & erection cost of these materials and later on, is required to maintain healthiness of these items.

2. Those stakeholders who have already deposited the Integration Charges for Meter(s) per Bay to STOMS (As per earlier guidelines issued on 04.06.2018 table Sr. No. B-3) in the year 2019-20, shall have to deposit the differential charges before integration of the meters. No certificate shall be issued till the differential charges are deposited.
TECHNICAL SPECIFICATION FOR 3 PHASE, 4 WIRE 0.2S CLASS AC STATIC INTER
UTILITY TARIFF TRIVECTOR METER FOR EHV SYSTEM OF RVPN SUITABLE FOR TARIFF
METERING AS WELL FOR ENERGY ACCOUNTAL

(ABT METERS)

1.0 SCOPE

1.1 This specification covers the design, engineering, manufacture, assembly inspection,
testing at manufacturer's works before dispatch, supply and delivery at site / FOR
destination anywhere in Rajasthan of class 0.2S accuracy static HT trivector tariff meters
as per requirement given in this specification. The meters shall be used for commercial /
tariff metering for bulk and inter utility power flows as well for T&D loss calculation.

1.2 The meter shall be installed on various EHV lines as a self contained device for
measurement of parameters in a programmable time clock initially set at 15 minute blocks.
Meter shall also measure and display reactive energy (lag and lead) under voltage low
(97%) and voltage high (103%) conditions as per tariff requirement. The meter shall also
measure and display true cumulative energy import and export on daily and monthly basis.

1.3 Manufacturer should possess fully computerized meter test bench system for carrying out
the relevant routine / acceptance tests as well facility to generate test reports for each and
every meter tested.

1.4 The manufacturer should have duly calibrated Electronic Reference Standard (ERS) meter
of accuracy class 0.02 or better.

1.5 The meter should be 3 phase, 4 wire type suitable for connection to 3 phase 4 wire as well
as 3 phase 3 wire system. The meter shall be capable of measuring in all the 4 quadrants.
The meter should be capable of recording and displaying active, reactive and apparent
energy and maximum demand for 3 phase 4 wire as well as 3 phase 3 wire AC balanced /
unbalanced loads without affecting the accuracy for a power factor range of zero (lagging),
unity and zero (leading) for export and import as per requirement given in this
specification.

1.6 The meter shall have following features:

   a) For transfer of data, meter should have multiple communication ports for local
      reading and remote communication facility. It should support simultaneous
      communication over different ports.

   b) Individual meter should drive operating power from VT/CVT supply. It should
      operate normally on VT/CVT supply and automatically switch over to DC
      auxiliary supply. The provision of auxiliary supply of 220 V DC/110V DC should
      be made in the meter. The voltage regulation in the auxiliary supply shall be
      within +/- 20%.

   c) The meter should have facility for time synchronization with GPS clock or any
      other means for uniformity.

1.7 It is not the intent to specify completely herein all the details of the design and construction
of material. The material shall, however, conform in all respects to high 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
meaning of drawings and specification and shall have the power to reject any work or
material which in his judgement is not in accordance therewith. The offered materials shall
be complete with all accessories, hardware, software and components necessary for their
effective and trouble free operation. Such components shall be deemed to be within the
scope of bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 STANDARDS APPLICABLE

2.1 Unless otherwise specified elsewhere in this specification, the performance and testing of the meters shall conform to the following Indian/International Standards and all related Indian/International standards to be read with up to date and latest amendments/revisions thereof:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Standard No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IS 14697-1999 with latest amendment</td>
<td>AC static transformer operated Watthour and VAR – Hour meters, class 0.2S &amp; 0.5S.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To be referred for tests for immunity against AC &amp; DC magnetic induction of external origin as per revised values given at Clause 4.6.4, Table – 17, Influence Quantities.</td>
</tr>
<tr>
<td>3</td>
<td>IEC – 60687 – 2000 with latest amendment</td>
<td>AC static Watthour meters for active energy, class 0.2S &amp; 0.5S.</td>
</tr>
<tr>
<td>4</td>
<td>IS – 9000 with latest amendment</td>
<td>Basic environmental testing procedures for electronic and electrical items.</td>
</tr>
</tbody>
</table>

2.2 The meters shall bear BIS Certification mark.

2.3 Meters matching with requirements of other national or international standards which ensure equal or better performance than the standards mentioned above shall also be considered. When the equipment offered by the tenderer conforms to standards other than those specified above, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the relevant
3.0 CLIMATIC CONDITIONS:
3.1 CLAMATIC CONDITIONS: Refer clause 33.0 of GTC (Part-II, Volume-II)
3.2 Auxiliary Power Supply: Refer clause 24.0 of GTC (Part-II, Volume-II)

4.0 PRINCIPAL PARAMETERS
4.1 Supply system:
Rated voltage (Vref) 3 x 110/3 V, phase to neutral
(Through PT) (3 phase 4 wire system)
3 x 110 V, phase to phase
Meter shall be programmed for
-3 x 110 V (Phase – Phase)
-3 x 110/3 V (Phase – Neutral)
Rated current (basic current, lb) 3x -/1 Amps, or
(Connected through CT) 3x -/5 Amp as per requirement

Multiplying factor to arrive at actual primary values wherever applicable shall be calculated from the CT and PT ratio of the installed CTs and PTs.

5.0 GENERAL TECHNICAL REQUIREMENTS:
5.1 The micro processor based 3 phase 4 wire metering system shall conform to class 0.2S as per IS:14697-1999 and meter mounting shall be either projection type or Rack type as per specification and site requirement.
5.2 The active energy measurement (Wh) shall be carried out on 3 phase 4 wire principle with an accuracy as per class 0.2S of IS:14697-1999. In the meters, the energy shall be computed directly in CT/VT secondary quantities and indicated in Watthours. The meters shall compute the active energy (Wh) import and export from the sub station during each successive 15 minute block and store in its memory. It shall also display on demand the Wh import and export during the previous 15 minutes block.
5.3 Further, the meter shall continuously integrate and display on demand the accumulative active energy import and export from the sub station upto date & time. The cumulative Watthour reading at each midnight shall be stored in the meter memory. Separate register shall be maintained for active energy import and export.
5.4 The meter shall count the number of cycles in VT/CVT output during each successive 15 minute block and divide the same by 900 to arrive at the average frequency. This shall be available in the report generated as a two digit code, which shall be arrived at by subtracting 49 from the average frequency, multiplying by 50 and neglecting all decimals. For example 49.89 Hz. shall be recorded as 44. In case the average frequency is less than 49 Hz. it shall be recorded as 00. In case it is 51.0 Hz. or higher it shall be recorded as 99. The average frequency of the previous 15 minute block shall also be displayed on demand in Hertz.
5.5 The meter shall continuously compute the average of the RMS value (fundamental only) of the 3 phases to neutral VT/CVT secondary voltage and then display the same on demand.

5.6 The meter shall also compute the reactive power (VAR) on 3 phase 4 wire principle and integrate the reactive energy (VARh) algebraically in two separate registers, one for the period for which RMS voltage is 103% or higher and the other for the period for which the RMS voltage is below 97%. Limits of error shall conform to IS 14697 for class 0.5S. The current reactive power (VAR), with a minus sign if negative, and cumulative reactive energy (VARh) reading 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. In the meter, the reactive power and reactive energy transmittals shall be computed in VAR / VARh directly calculated in VT/CVT and CT secondary quantities. When lagging reactive power is being sent out from the Sub Station, VAR display shall have no sign and VARh registers shall move forward. When reactive power flow is in the reverse direction, VAR display shall have a negative sign and VARh registers shall move backwards.

5.7 Four cumulative energy registers for reactive energy should be available on meter display.

a) Reactive energy lag while active energy import.

b) Reactive energy lag while active energy export.

c) Reactive energy lead while active energy import.

d) Reactive energy lead while active energy export.

5.8 Each meter shall have a built in calendar in clock. The maximum drift permissible in the real time clock shall be +/- 2 minutes / year for 0.2 S class meters. The calendar and clock shall be correctly set at the manufacturer’s works. The date (day – month – year) and time (hour – minute – seconds) shall be displayed on the meter front on demand. Clock adjustment shall be possible remotely using time synchronization signal through modem and or MPLS system. For the purpose of getting standard time, the computer from where the meter will be read shall be equipped with GPS signal receiver.

5.9 Each meter shall have a unique identification code, which shall be marked permanently on the front as well as in its memory.

5.10 Each meter shall have a non volatile memory in which the following shall be automatically stored. The non volatile memory should retain data for a period not less than 10 years under un-powered condition. Battery back up memory will not be treated as NVM and shall not be accepted.

5.10.1 Average frequency for each successive 15 minutes block upto second decimal.

5.10.2 Wh transmittal during each successive 15 minutes block upto second decimal for import and export separately.

5.10.3 Cumulative Wh transmittal at each mid night.

5.10.4 Cumulative VARh transmittal for voltage high condition at each mid night.

5.10.5 Cumulative VARh transmittal for voltage low condition at each mid night.

5.10.6 Failure of VT supply on any one phase as a star (*) mark in load survey data.

5.11 The meters shall store all the above listed data in their memories for a period of 22 days. The data older than 22 days shall get erased automatically.

5.12 It shall be possible to obtain data from the meter in the following form.

<table>
<thead>
<tr>
<th>Date: Time</th>
<th>Frequency</th>
<th>Wh. (import)</th>
<th>Wh. (Export)</th>
<th>Wh. (Net)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00: 15</td>
<td></td>
<td>12.22</td>
<td>25.22</td>
<td>-13.00</td>
</tr>
<tr>
<td>00:30</td>
<td></td>
<td>13.91</td>
<td>23.91</td>
<td>-10.00</td>
</tr>
</tbody>
</table>
5.13 All meters shall be totally identical in all respects except for their unique identification codes. They shall also be totally sealed with no possibility of any adjustment at site except for clock correction.

5.14 The meters shall safely withstand the usual fluctuation arising during faults, in particular, 115% of rated VT/CVT secondary voltage applied continuously and 190% of rated secondary voltage for 3 seconds, and 120% of rated CT secondary current applied continuously and 20 times of maximum current applied for 0.5 seconds, shall not cause any damage to or the maloperation of the meters.

5.15 Individual meter should drive operating power from VT/CVT supply. It should operate normally on VT/CVT supply and automatically switch over to DC auxiliary supply when VT/CVT supply fails. The provision of auxiliary supply of 220 V DC/110V DC should be made in the meter. The voltage regulation in the auxiliary supply shall be within +/- 20%.

5.16 An automatic back up for the continued operation of the offered meters clock and calendar shall be provided through a long life battery which shall be capable of supplying the required power for at least two years under meter un-powered conditions. The offered meters shall be supplied duly fitted with the battery that shall not be required to be changed for at least 10 years, as long as total VT interruption does not exceed two years.

5.17 Power Factor Range:

The meter shall be suitable for full power factor range from zero (lagging) through unity to zero (leading). The meter should work as an active energy import and export and reactive (lag and lead) energy meter.

5.18 Power Supply Variation

The meter should be suitable for working with following supply variations:

- Specified operating range: 0.8 to 1.1 Vref.
- Limit range of operation: 0.7 to 1.2 Vref
- Frequency: 50 Hz ± 5 %.

5.19 Accuracy

Class of accuracy of the meter shall be 0.2S for active energy & 0.5S for reactive energy. The accuracy should not drift with time. The measurement of accuracy of the parameters shall be as under:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Accuracy class of meter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2S</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
</tr>
</tbody>
</table>
5.20 Power Consumption

i) Voltage Circuit: The active and apparent power consumption in each voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency shall not exceed 1.5 Watt per phase and 10 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.

5.21 Starting Current

The meter should start registering the energy at 0.1% lb at unity power factor.

5.22 Maximum Current

The rated maximum current of the meter shall be 120% lb.

6.0 GENERAL AND CONSTRUCTIONAL REQUIREMENTS

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

a) Personnel safety against electric shock
b) Personnel safety against effects of excessive temperature.
c) Protection against heat & spread of fire.
d) Protection against penetration of solid objects, dust and water.
e) Protection against radio interference.
f) Protection against electro-magnetic & electro-static fields.
g) Protection against shock & vibration.
h) Protection against fraud.
i) Prevention against pilferage.

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

6.3 The meter shall be designed with application specific non-editable integrated circuits/microprocessors. The electronic components shall be mounted on the printed circuit board using latest technology.

6.4 All insulating materials used in the construction of meters shall be non-hygrosopic non-ageing and of tested quality. All parts that are likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

6.5 The meter mounting shall be either projection type or rack type as per specification and site requirement.

6.6 Each meter shall have a test output device (visual) for checking the accuracy of active energy (Wh) and reactive energy (VARh) measurement using a suitable test equipment. The test output shall not be software configurable. It should be possible to select the output for active energy import / export and reactive energy lag / lead by operation of the push button(s)/ keypad provided on the meter for scrolling through the menu / display.
6.7 The meter shall have an operation indication device such as a blinking LED/LCD. The operation indicator shall be visible from the front window. Separate indicators shall preferably be provided for Wh & VArh pulse indication. In case only one indicator is provided, it should be possible to select Wh or VArh pulse with the use of push buttons/ keypad/ menu selection provided on the meter (access through software should not be required).

6.8 The meter shall be suitable for being connected through test terminal blocks to the voltage transformer having a rated secondary line to neutral voltage of 110/√3 V and to current transformers having a rated secondary current of 1A or 5A as per requirement. 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 may occur in the VT/CVT/CT circuits of the EHV switchyards.

6.9 A keypad / Push buttons(s) shall be provided on the front of the main control module for switching on the display of the metering module / parameters selected and for changing from one indication to the next. Menu driven or other forms of display can also be accepted provided they meet RVPN requirements. Such arrangements shall be demonstrated and got approved from RVPN, during technical bid evaluation.

6.10 The meter shall have communication facilities as per IS 15959 – 2011: Indian Standard – Data Exchange for Electricity Meter Reading, Tariff and Load Control – Companion Specification.

a) It shall also be possible to retrieve on line data through RS485, TCP/IP port simultaneously through either USB Port or optical port.

b) The meter shall be provided with the following ports:

i) RS 485 port for periodic data transfer to Sub Station data logger / Computer. RS 485 communication port shall be suitable for interfacing multiple Energy Meters. It shall be possible to download stored meter data on polling basis with the aid of a software schedule by addressing one meter at a time and downloading the stored data into the Sub Station data logger / Computer / Data Acquisition Server.

ii) Network port (TCP / IP based) for periodic transfer through communication medium to the Data Acquisition Server.

iii) Galvanically isolated optical communication port in front of the meter for data transfer to or from Laptop.

iv) A USB port which will be an integral part of meter and available at front side of meter covered suitably for sealing purpose. This USB port shall support Laptop for reading the meter data as an alternate media for CMRI meter reading.

c) It should support simultaneous communication over different ports.

6.11 The 15 minute block wise data (energy, anomaly, average parameters, etc.) in the meter shall be required to be communicated to central billing station, Heerapura. The communication with the meter shall be as described at 6.10 above. The meter shall be capable of such communication.
6.12 Each meter shall have an optical galvanically isolated communication port and USB port compatible to RS 232 on its front for tapping all data stored in its memory. The communication protocol should be open as per DLMS, IS 15959-2011. Laptop shall be used for this purpose as per requirement to serve as interface between the meters specified above and data acquisition server. The overall intention is to tap the data stored in the meter memory ON LINE using the modem and a remote central computer through Communication system and the Laptop as a back up in case of break down of the communication system. It shall also be possible to obtain a print out (hard copy) of all data collected from the meters using the PC. Remote meter reading software shall be supplied by the bidder.

6.13 The meter shall conform to the degree of protection IP 51 of IEC 60687 for protection against ingress of dust, moisture and vermin.

6.14 The meter-base, meter-cover, terminal block shall be made of unbreakable, high grade, fire-resistant, reinforced, non-inflammable, high grade and good quality engineering plastic/suitable material to ensure safety. The manufacturer shall clearly indicate the material used.

6.15 The meter cover shall have one window. The window shall be of transparent, UV stabilized polycarbonate or equivalent high grade engineering plastic for easily reading all the displayed values/parameters, name plate details and observation of operation indicator. The window shall be ultrasonically welded with the meter cover such that it cannot be removed undamaged without breaking the meter cover seals.

6.16 The terminal block shall be of high grade non hygroscopic, fire retardant, low tracking, fire-resistant, high grade engineering plastic (not bakelite) which should form an extension of the meter case, meeting the requirement of clause No.6.4 of IS 14697/ Clause No. 4.2.4 of IEC 1036-1996. The current circuit conductors of a meter shall be connected to its current terminals inside the meter terminal block adopting any of the recommended methods given in clause 6.4 – Annexure B of IS-13779 – 1999.

6.17 The manner of fixing the conductors to the terminal block shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the meter shall screw into a metal nut. All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Two screws shall be provided in each current terminal for effectively clamping the external leads of thimbles. Each screw shall engage at least 3 threads in the terminal. The ends of screws shall be such as not to pierce the conductor. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material. The internal diameter of the terminal holes shall be 5.5 mm. The clearances and creepage distances shall conform to clause 6.6 of IS 14697 -1999. Minimum center to center clearance between adjacent connections shall be 13.5 mm. Alternate equivalent manners of fixing/ connecting conductors/ wires to the meter may be proposed but shall have to be demonstrated during pre-bid evaluation for acceptance by RVPN.

6.18 In case of the terminal block and the meter case, reasonable safety shall be ensured against the spread of fire. The material should not be ignited by thermic overload of live parts in contact with them.

6.19 The meter shall be compact in design. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibrations during transportation and handling.

6.20 SEALING OF THE METER:
a) Reliable sealing arrangement should be provided to make the meter tamper-proof and to avoid tampering by unauthorized persons.

b) The body / cover of the meters shall be sealed by the manufacturer at his works. In addition, one more body / cover sealing point shall be provided for sealing the meters after installation.

c) Two Nos. sealing points shall be provided for sealing the meter terminal cover.

d) One sealing point shall also be provided for each communication port.

e) One sealing point shall also be provided for the MD reset button (if such button is provided).

f) A tracking and recording software for all new seals shall be provided by the manufacturer of the meters so as to track total movement of seals starting from manufacturing, procurement, storage, record keeping, installation, series of inspections, removal and disposal.

g) Only the patented seals (seal from the manufacturer who has official right to manufacture the seal) shall be used.

h) Polycarbonate or acrylic seals or plastic seals or holographic seals or any other superior seal shall be used. Lead seals shall not be used in the meters.

i) Rear side sealing arrangement will not be preferred, unless specifically agreed to.

j) The sealing arrangement should be explained by the suppliers in their offer.

6.21 MARKING OF METER:

The meter terminal marking and mounting arrangement should be as per Indian installation practices. The marking on every meter shall be in accordance with IS 14697-1999 / IEC 60687-2000.

Every meter shall have name plate beneath the meter cover such that the name plate cannot be accessed without opening the meter cover and without breaking the seals of the meter cover. The name plate shall be marked indelibly. The name plate marking should not fade or otherwise be adversely affected by UV exposure with lapse of time. The basic markings on the meter name plate shall be as follows:-

i. Manufacturer’s name and trade mark.
ii. Type designation.
iii. Number of phases and wires.
iv. Serial Number.
v. Month and year of manufacture.
vi. Reference voltage and PT ratio.
vii. Rated secondary current of CT (~/1 A) or (~/5 A) as per requirement.
viii. Principal unit(s) of measurement.
ix. Meter constant (Imp/kWh, Imp/kVARh).
x. Class index of meter.
xii. “Property of RVPNPL”.
ixii. RVPNPL’s purchase order number and date.
xiii. Guarantee period.
xiv. BIS Certification Mark.

xv. ABT Meter.

6.22 Connection Diagram And Terminal Markings:

The connection diagram of the meter for 3 phase 4 wire system as well as 3 phase 3 wire system shall be clearly shown on meter body. The meter terminals shall also be marked and this marking should appear in the above diagram.

6.23 SOFTWARE:

50 numbers/sets of licensed copies of the following software shall be supplied in addition to those installed on Laptop by the supplier without extra cost. The supplier shall impart necessary training regarding installation and use of the above software.

a) Software for reading, down loading data, time setting in the meter to be installed in the Laptop being purchased separately under this TN.

The software shall be suitable for Windows or higher version. The software shall be installed in the Laptop as well as supplied separately in the form of CDs. Software should be suitable and configurable to other kinds of tariff within the recorded parameters/data provided by the meter.

ABT programming should be enabled at Laptop and Basic Computer System under multi level password protected security system for specified meter(s).

b) Windows based Basic Computer Software (BCS) for receiving data from Laptop and from meter directly through USB port and optical port or other specified communication system and downloading/programming instructions to Laptop. This BCS should have, amongst other requirements and features and facilities described in detail in the specifications for Laptop, the facility to convert meter reading data into user definable ASCII format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data on line in desired manner. The necessary training if required, and documentation for this purpose shall also be provided free of charge.

c) Necessary software for loading application program via Laptop serial port shall be made available separately.

d) Any other special application software of the manufacture for the meter.

Any future upgradation made by the bidder in any of the above software shall also be provided free of cost.

7.0 SALIENT FEATURES:

The meter shall have the following additional salient features:

7.1 The 3 line to neutral voltages shall be continuously monitored by individual phase wise LEDs or by any other indications. In case any of these voltages falls below 50%, the
normally flashing / steady lamp / indication provided on the meters front becomes steady/off. The time blocks in which such a voltage failure occurs/persists shall also be recorded in the meter’s memory. The indication shall automatically resume normal function when corresponding VT secondary voltage is healthy again. The two VArh registers specified in clause 5.6 shall remain stay put while VT supply is unhealthy.

7.2 Individual meter should drive operating power from VT/CVT supply. It should operate normally on VT/CVT supply and shall automatically switch over to DC auxiliary supply when VT supply fails. The provision of auxiliary supply of 220 V DC/110V DC should be made available in the meter. The voltage regulation in the auxiliary supply shall be within +/- 20%.

7.3 The meters should be provided with pulse output coincident with end of its demand period.

7.4 The meter should have LCD multiple display with backlit/LED and should have page wise display of multiple parameters with option of configuration favorite parameters under the favorite page.

7.5 It should be possible to check the healthiness of phase voltages by displaying all the voltages on the meter display.

7.6 The meter should work accurately irrespective of phase sequence of the mains supply.

7.7 It should be possible to check the correctness of connections of CT/VT/CVT to the meter with proper polarity. This feature may be made available on the meter display or on Laptop. For this purpose, suitable software for field diagnosis of meter connections with the help of meter and Laptop should be supplied as per Annexure – G – 15 of IS 14697-1999.

7.8 The meter should continue to record accurately as per prevailing electrical conditions even if the neutral of potential supply gets disconnected.

7.9 The meter shall be provided with adequate magnetic shielding so that any external magnetic field (AC electro magnet or DC magnet) as per the values specified in CBIP Publication No. 304 (with latest amendments) applied on the meter shall not affect the proper functioning and recording of energy as per error limits prescribed by CBIP.

7.10 It shall not be possible to change the basic meter software by any means in the field. Moreover, critical events like time set, MD reset operation and tariff change shall be logged by the meter. Such events shall be logged in roll over mode for minimum ten events.

7.11 Display Of Measured Values:

a) The measured value(s) shall be displayed through Liquid Crystal Display (LCD backlit) or Light Emission Diode (LED) display.

b) The data should be stored in Non Volatile Memory. The non volatile memory should retain data for a period of not less than 10 years under un-powered condition. Battery backup memory will not be considered as NVM.

c) It should be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciator. A separate legend plate indicating the symbols shall be supplied by manufacturer along with each meter.

d) The register shall be able to record and display, starting from zero, for a minimum of 1500 hours, the energy corresponding to rated maximum current at reference voltage and unity power factor for CT ratio up to 1000/1A for 1 Amp meters and for PT ratio up to 400 KV/110 V. The register should not roll over in between this duration.
e) Any interrogation/read operation shall not delete or alter any stored meter data. The meter should continue to read & store data even during simultaneous interrogation/read operation through Laptop/online and should not stop working on this account.

7.12 Meter Serial Number:

In addition to providing serial number of the meter on the display plate, the meter serial number shall also be programmed into meter memory for identification through Laptop meter reading print out and optionally on meter display.

7.13 Display Sequence:

The meter shall display the required parameters on suitable selection through key pad or push button(s) or menu selection.

a) LED / LCD segment check.
b) Real time – Hour, Minutes, Seconds.
c) Date – dd, mm, yy.
d) Meter serial number.
e) Power On hours.
f) Cumulative MD reset count.
g) Active energy import (Wh on 15 minutes block basis for previous block)
h) Active energy export (Wh on 15 minutes block basis for previous block)
i) Average frequency of previous block in Hz.
j) Average voltage.
k) Cumulative Reactive energy for voltage high condition.  
   (i.e., net VArh when RMS voltage is ≥ 103% Vn).
l) Cumulative Reactive energy for voltage low condition.  
   (i.e., net VArh when RMS voltage is < 97%).
m) Energy registers of active, reactive and apparent energies for True import / export cumulative readings :
   i) Cumulative Active energy import (Wh).
   ii) Cumulative Active energy export (Wh).
   iii) Cumulative Reactive energy lag (VArh lag) while Wh import.
   iv) Cumulative Reactive energy lag (VArh lag) while Wh export.
   v) Cumulative Reactive energy lead (VArh lead) while Wh import.
   vi) Cumulative Reactive energy lead (VArh lead) while Wh export.
   vii) Cumulative Apparent energy (VAh) while Wh import.
   viii) Cumulative Apparent energy (VAh) while Wh export
   ix) High resolution energy registers (Minimum 4 digits after decimal).
      i) Wh - *****
      ii) VArh lag - *****
      iii) VArh lead - *****
      iv) Vah - *****
Note: If energy readings upto 4 decimal or more digits are provided on the main registers, then high resolution energy registers as given at sequence (m ix)) will not be required separately. Alternatively, the same can be given on the CMRI.

n) Instantaneous power factor with sign for lag / lead.
o) Cumulative maximum demand (VA)
p) Instantaneous phase voltage.
   i) R phase voltage
   ii) Y phase voltage
   iii) B phase voltage
q) Instantaneous line currents (Amps.)
   i) R phase line current
   ii) Y phase line current.
   iii) B phase line current
r) Frequency
s) Phase sequence of voltages.
t) Detailed phase wise anomaly information should, however, be logged in the meter memory and be available for downloading to the BCS directly.
u) VAh import during the block when voltage was less than 97% of nominal voltage.
v) VAh export during the block when voltage was more than 103% of nominal voltage.
w) Instantaneous load in
   i) W
   ii) VA
   iii) VAR
x) Maximum demand in VA / W since last reset.
y) Anomaly data:
   i) Present status of anomaly
      a) Missing potential with phase identification
      b) CT polarity reversal with phase identification
      c) Current unbalance.
   ii) Date and time of last anomaly occurrence with type of anomaly.
   iii) Date and time of last anomaly restoration with type of anomaly.
   iv) Cumulative anomaly count of all types of anomalies and all phases.

Detailed phase wise anomaly information should, however, be logged in the meter memory and be capable of down loading through the BASIC COMPUTER SOFTWARE.

7.14 Output Device:

The meter shall have a test output accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator, if fitted, must be visible
from the front. Test output device shall be provided in the form of one common LED / LCD for Wh & VARh with the provision of selecting the parameter being tested by the use of the keypad / push button(s)/ menu selection. Alternatively, test output device in the form of separate LEDs / LCDs for Wh & VARh is also acceptable.

The relation between test output and the indication on display shall comply with the marking on the name plate (impulse per Wh/VARh).

The manufacturer shall state the necessary number of pulse count(s) to ensure measurement accuracy of at least $1/10^6$ of class of the meter at the different test points.

The resolution of the test output pulse(s) should be sufficient to enable conduction of the starting current test in less than 10 minutes and accuracy test at the lowest load with desired accuracy within 5 minutes.

7.15 Time Synchronization:

The time synchronization should be possible from remote through communication port(s) of the meter using time synchronization signal received from GPS through Communication system and/ or modem.

7.16 Maximum Demand (MD) registration:

The meter shall continuously monitor and calculate the average demand in VA/ W during the integration period set, and the maximum out of these shall be stored in the meter memory along with date and time when it occurred. The maximum registered value shall also be made available on meter display.

The integration period shall be set as 15 minutes on real time basis which shall be capable of being changed to other integration period also, if required.

The principal of maximum demand calculation used by the bidder should be explained in the offer.

A pulse output coincident with end of each demand period shall be provided in the meter.

7.17 Maximum demand reset:

Facility for auto reset of MD at predefined date and time shall be provided. The meter shall display the maximum demand reset count.

7.18 Load survey capability and billing point requirements:

The meter shall be capable of recording following data for 15 minutes integration period for at least last 22 days.

a) Wh Import.
b) Wh Export.
c) VARh Lag when Wh is Import.
d) VARh Lag when Wh is Export.
e) VARh Lead when Wh is Import.
f) VARh Lead when Wh is Export.
g) VAh when Wh is Import.
h) VAh when Wh is Export.
i) VArh Import when voltage was less than 97%.
j) VArh Export when voltage was more than 103%.

The meter shall also be capable of recording the 15 minute average values of the following data for at least last 22 days.
i) W Import.
ii) W Export.
iii) VA Import.
iv) VA Export.
v) All the three phase voltages i.e. RN, YN and BN.
vi) All the three phase currents i.e. R, Y & B.
vii) Power Factor.
viii) Frequency

It shall be possible to select either demand or energy view in the Basic Computer Software.

The average frequency should be logged with a marking of time advance / retard and voltage low event if occurred in that integration period. Voltage low marking should be locked when average voltage goes below 60% of Vref.

The load survey data should be available in the form of bar charts as well as in spread sheets. The Basic Computer Software shall have the facility to give the complete load survey data both in numeric and graphic forms.

The figures of 24 hourly Wh import, Wh export and VAh import, VAh export should also be made available under each date in the load survey or otherwise, it should be possible to calculate such figures through Basic Computer Software.

The predefined date and time for registering the billing parameters of Wh import, Wh export, VAh import, VAh export, PF import, PF export and VA MD import, VA MD export shall be 00.00 hours of the first day of each calendar (billing) month. All billing parameters shall be transferred to billing registers and shall be displayed on display mode referred to as ‘BILLING PARAMETERS’.

The above billing data, load survey data, anomaly information and instantaneous parameters data shall all be retrievable as stored in the preset cyclic order through the meter’s communication ports through a Laptop and the other communication ports. It shall be possible to transfer (down load) this data to a PC with windows based software to get complete details in numerical and graphic forms. The necessary Basic Computer Software (BCS) for this purpose shall be provided by the bidder with complete details. The 15 minute data required for on line transmission to the Data Center, Jaipur through the communication ports shall be as given at clause 7.26. However, the software/tool required for obtaining the information through the communication ports of the meter as above shall be supplied by the manufacturer.

Further, apart from instantaneous parameters like voltage, current, PF and readings of billing parameters, energy registers, etc., the following additional parameters should be made available at the Basic Computer Software:
a) Meter programming count.

b) MD reset count.

c) Billing parameters for last three months.

7.19 Harmonics measurements:

The meter should be capable of measuring fundamental energy as well total energy, i.e., fundamental plus harmonics energy. Fundamental energy should be made available on meter display and the same shall be used for billing purpose.

The supplier shall indicate the sampling rate so that it shall be sufficient for the user to determine the accuracy of total energy.

The values of total energy shall be made available either on meter display or on BCS with proper resolution.

The supplier shall state as to how he will meet the above requirement and finally the above requirement shall be mutually agreed between user and supplier.

The total energy (fundamental plus harmonic energy) shall be logged in the meter memory and be capable of down loading to the BCS directly.

7.20 Self Diagnostic Feature:

The meter shall be capable of performing complete self diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.

The meter shall have indications for unsatisfactory / non-functioning / malfunctioning of the following as per the requirement under G 19 of IS 14697:

a) Time and date, and
b) All display segments.

The meter shall have indications for unsatisfactory / non-functioning of the following as per clause 6.10 of the CBIP Publication No. 304.

a) Time and Calendar
b) Real Time Clock
c) RTC Battery
d) Non-Volatile Battery

The details of malfunctioning of time and date should be recorded in the meter memory. The details of self diagnostic capability feature should be furnished by the bidder.

7.21 Tamper and Anomaly detection features:

The meter should have features to detect the occurrence and restoration of at least the following common ways of tamper/anomaly:

a) Missing potential: The meter shall be capable of detecting and recording occurrences and restoration of missing potential (1 phase or 2 phases) which can happen due to intentional / accidental disconnection of potential leads, along with the total number of such occurrences for all phases. Absence of one or more phase voltage from mains side should not be recorded as missing potential.

b) CT polarity reversal: The meter shall be capable of detecting and recording occurrences and restoration of CT polarity reversal of one or more phases.
c) **CT Short (Bypass) / Open**: The meter shall be capable of detecting and recording occurrences and restoration of shorting (bypassing) / opening of any one or two phases of CT when the meter is connected to a 3 phase 4 wire system. This feature shall not be available if and when the meter is connected to a 3 phase 3 wire system.

d) **Current and voltage unbalance**: The meter shall be capable of detecting and recording occurrences and restoration of current and voltage unbalance separately as an anomaly event.

Snap shots (numerical values) of voltage, current, power factor and energy (Wh/kWh) readings as well as the date and time of logging of the occurrence and restoration of all anomaly events, subject to meter memory space as described herein under, should be logged in the meter memory and available for retrieving through the meter's optical port/USB port to the Basic Computer Software.

e) **Power On/Off**: If all the voltages are not available, power OFF event should be logged, and power ON event should be logged when supply is available. The power ON and OFF event should be logged with date and time.

Minimum hundred (100) events (occurrence and restoration) of all types of anomaly with date and time shall be available in the meter memory on first-in, first-out basis. It shall be possible to retrieve the anomaly data along with all related snap shots data through the meter's optical port with the help of communication system available and down load the same to the Basic Computer Software where it shall be available for viewing. All this information shall be available in simple and easily understandable format.

### 7.22 Anomaly detection logic:

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

The threshold values and logic for voltage, current and PF, etc. for the purpose of logging occurrence and restoration of various types of anomalies are given below at clause 7.23. The bidder may, however, propose other logics/ values in their offer based on their experience.

### 7.23

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tamper event with date and time</th>
<th>Occurrence</th>
<th>Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Missing Potential :</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Voltage</td>
<td>&lt;20% Vref</td>
<td>&gt;40% Vref</td>
</tr>
<tr>
<td>b)</td>
<td>Line current</td>
<td>&gt;10 % Ib</td>
<td>Ignored</td>
</tr>
<tr>
<td>c)</td>
<td>Persistence Time</td>
<td>5 Min.</td>
<td>120 Seconds</td>
</tr>
</tbody>
</table>

Notes : 1) Missing potential should be phase wise.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tamper event with date and time</th>
<th>Occurrence</th>
<th>Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2)</td>
<td>Absence of one or more phase voltages from supply side should not be recorded as missing potential.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. CT Polarity Reversal : (Phase wise)

a) Line current in tampered phase
   >5% Ib (Current direction negative)
   Current direction becomes positive

b) Power Factor
   >0.2
   Not applicable

c) Persistence Time
   5 Min.
   120 Seconds

Notes : 1) Current reversal detection will be phase wise.

3  Current Short / Bypass:

a) Vector sum of line currents
   \((I_A + I_Y + I_B) > 20\% \text{ lb}\)
   \((I_A + I_Y + I_B) < 5\% \text{ lb}\)

b) Persistence Time
   5 Min.
   120 Seconds

Notes : 1) Current Short / Bypass detection shall be phase wise.

4  Current Unbalance:

a) Max. Current – Min. Current
   > 5% lb
   <1% lb

b) Persistence Time
   5 Min.
   120 Sec.

5  Voltage Unbalance

a) \(((\text{Max. Voltage-Min. Voltage}) \times 100)/\text{Avg.}) > 5\% \text{ Vref.}\)
   <1\% \text{ Vref.}\)
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tamper event with date and time</th>
<th>Occurrence</th>
<th>Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Persistence Time</td>
<td>5 Min.</td>
<td>120 Sec.</td>
</tr>
</tbody>
</table>

Note: Any temper event will be logged only when the meter senses all respective threshold conditions.

7.24 There shall be four separate compartments for logging of different type of anomalies as follows:

Compartment No.1:

25% of total anomaly memory space shall be allocated for the following current related anomalies:

- CT polarity reversal
- CT open circuit
- CT short (by pass)

Compartment No.2:

25% of total anomaly memory space shall be allocated for missing potential and voltage unbalance anomalies.

Compartment No.3:

50% of total anomaly memory space shall be allocated for current unbalance anomalies.

Compartment No.4:

Twenty (20) events of power ON / OFF.

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

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

Bidders may indicate alternate proposals for the above anomaly detection and logging scheme.
Anomaly count should increase as per occurrence (not restoration) of anomaly events. The total number of anomaly counts should also be provided on the meter display as well as at the Basic Computer Software end.

7.25 Anomaly Persistence Time:

The persistence time for logging/registration of an occurrence of an anomaly should be 5 minutes ±10 seconds. The persistence time for logging of restoration of anomaly should not be more than 120 seconds.

7.26 Transmission of Data:

The following parameters (15 minutes block time) are required to be transmitted from the ABT meters to the Data Center.

Load Survey Parameters: - The parameters listed below in this Table are for load survey purpose and are logged as per the block period time i.e 15 minutes for which the data storage will be 22 days.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Real time clock, date and time.</td>
</tr>
</tbody>
</table>

**Average Value of 15 minutes block period.**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frequency</td>
</tr>
<tr>
<td>2</td>
<td>Voltage VRN</td>
</tr>
<tr>
<td>3</td>
<td>Voltage VYN</td>
</tr>
<tr>
<td>4</td>
<td>Voltage VBN</td>
</tr>
</tbody>
</table>

**Actual Energy consumption during 15 minutes Time Block**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Energy – Active Import</td>
</tr>
<tr>
<td>2</td>
<td>Energy – Net active energy</td>
</tr>
<tr>
<td>3</td>
<td>Energy - Active Export</td>
</tr>
<tr>
<td>4</td>
<td>Energy kVarh, Quadrant -I</td>
</tr>
<tr>
<td>5</td>
<td>Energy kVarh, Quadrant -II</td>
</tr>
<tr>
<td>6</td>
<td>Energy kVarh, Quadrant -III</td>
</tr>
<tr>
<td>7</td>
<td>Energy kVarh, Quadrant -IV</td>
</tr>
</tbody>
</table>

Daily Load Profile Parameter: - The parameters listed below in the Table are meant for billing purpose and shall be logged at mid night (00.00 Hours). The storage time for these parameters is 22 days.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Real time clock, date and time.</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>2</td>
<td>Cumulative energy, kWh (Import)</td>
</tr>
<tr>
<td>3</td>
<td>Cumulative energy, kWh (Export)</td>
</tr>
<tr>
<td>4</td>
<td>Cumulative energy, kVArh while kW import</td>
</tr>
<tr>
<td>5</td>
<td>Cumulative energy, kVArh while kW Export</td>
</tr>
<tr>
<td>6</td>
<td>Reactive energy high (V &gt; 103 percent)</td>
</tr>
<tr>
<td>7</td>
<td>Reactive energy low (V &lt; 97 percent)</td>
</tr>
<tr>
<td>8</td>
<td>Cumulative energy, kVarh, Quadrant-I</td>
</tr>
<tr>
<td>9</td>
<td>Cumulative energy, kVarh, Quadrant-II</td>
</tr>
<tr>
<td>10</td>
<td>Cumulative energy, kVarh, Quadrant-III</td>
</tr>
<tr>
<td>11</td>
<td>Cumulative energy, kVarh, Quadrant-IV</td>
</tr>
</tbody>
</table>

The following parameters shall also be available for transmission through the communication ports indicated at clause 6.10.

a) Instantaneous Parameters:

<table>
<thead>
<tr>
<th>i)</th>
<th>Description</th>
<th>ii)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Real Time Clock – Date and Time</td>
<td>ii)</td>
<td>Current – IR</td>
</tr>
<tr>
<td>v)</td>
<td>Voltage – VRN</td>
<td>vi)</td>
<td>Voltage – VYN</td>
</tr>
<tr>
<td>vii)</td>
<td>Voltage – VBN</td>
<td>viii)</td>
<td>Voltage – VRY</td>
</tr>
<tr>
<td>ix)</td>
<td>Voltage – VBY</td>
<td>x)</td>
<td>Signed Power Factor – R Phase</td>
</tr>
<tr>
<td>xi)</td>
<td>Signed Power Factor – Y Phase</td>
<td>xii)</td>
<td>Signed Power Factor – B Phase</td>
</tr>
<tr>
<td>xiii)</td>
<td>Three Phase Power Factor – PF</td>
<td>xiv)</td>
<td>Frequency</td>
</tr>
<tr>
<td>xv)</td>
<td>Apparent Power – kVA</td>
<td>xvi)</td>
<td>Signed Active Power – kW (+ Import; – Export)</td>
</tr>
<tr>
<td>xvii)</td>
<td>Signed Reactive Power – kVAr (+ Lag; – Lead)</td>
<td>xviii)</td>
<td>Cumulative Energy – kWh (Import)</td>
</tr>
<tr>
<td>xix)</td>
<td>Cumulative Energy – kWh (Export)</td>
<td>xx)</td>
<td>Cumulative Energy – kVArh (Import)</td>
</tr>
<tr>
<td>xxi)</td>
<td>Cumulative Energy –</td>
<td>xxii)</td>
<td>Number of Power Failures</td>
</tr>
</tbody>
</table>

398
<table>
<thead>
<tr>
<th>kVAh (Export)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>xxiii) Cumulative Power Failure Duration</td>
<td>xxiv) Cumulative Tamper Count</td>
</tr>
<tr>
<td>xxv) Cumulative Billing Count</td>
<td>xxvi) Cumulative Programming Count</td>
</tr>
<tr>
<td>xxvii) Billing Date</td>
<td></td>
</tr>
</tbody>
</table>

7.27 Accuracy Requirement:

The accuracy of parameters measured by meters shall be tested in accordance with the relevant standards described in clause 2.0 of this specification. For apparent energy, accuracy testing shall be done in accordance with the provisions of annexure G 7 of IS 14697-1999. Time accuracy of the meter should be as per annexure G 18 of IS-14697-1999.

7.28 Electrical Requirement:

The electrical requirement of meter shall be as specified in the relevant standards described in clause 2.0 of this specification.

7.29 Electro Magnetic Compatibility And Interference Requirements:

The meter shall meet EMI / EMC requirements as specified in the relevant standards described in clause 2.0 of this specification.

7.30 Mechanical Requirement:

The meter shall meet the mechanical requirements as specified in the relevant standards described in clause 2.0 of this specification.

7.31 Climatic Influence Requirement:

The meter shall meet dry heat / cold / damp heat cyclic test requirements as per the relevant standards described in clause 2.0 of this specification.

8.0 LIFE EXPECTANCY:

The meter shall be designed to meet the life expectancy of 20 years.

9.0 TESTS FOR THE METER:

9.01 TYPE TESTS

The energy meters offered shall be fully type tested at NABL accredited Test Laboratories as per relevant standards described in clause No. 2.0 of the specification. The bidder must furnish two sets of type test reports in respect of AC static HT trivector meter of 0.2S accuracy class of both current ratings alongwith the bid. These type tests must not have
been conducted earlier than seven years from the date of opening of bid. Bids without type test reports will be treated as non responsive.

9.02 Names of Competent Laboratories as given in the CBIP Publication no. 304 (National Physical Laboratory or Laboratory accredited by NABL, India for the particular testing) where type tests can be conducted are listed below:

<table>
<thead>
<tr>
<th>No.</th>
<th>Short Name</th>
<th>Full Name of Testing Laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NPL</td>
<td>National Physical Laboratory, New Delhi</td>
</tr>
<tr>
<td>2</td>
<td>CPRI (Bangalore)</td>
<td>Central Power Research Institute, Bangalore</td>
</tr>
<tr>
<td>3</td>
<td>CPRI (Bhopal)</td>
<td>Central Power Research Institute, Bhopal</td>
</tr>
<tr>
<td>4</td>
<td>ERTL (N)</td>
<td>Electronics Regional Test Laboratory (North), New Delhi</td>
</tr>
<tr>
<td>5</td>
<td>ERTL (E)</td>
<td>Electronics Regional Test Laboratory (East), Kolkata</td>
</tr>
<tr>
<td>6</td>
<td>ERDA</td>
<td>Electronics Research &amp; Development Association, Vadodara</td>
</tr>
<tr>
<td>7</td>
<td>ETDC (Chennai)</td>
<td>Electronics Test &amp; Development Centre, Chennai</td>
</tr>
<tr>
<td>8</td>
<td>YMPL</td>
<td>Yadav Measurements Private Ltd., Udaipur</td>
</tr>
<tr>
<td>9</td>
<td>SML</td>
<td>Secure Meters Ltd., Udaipur</td>
</tr>
<tr>
<td>10</td>
<td>Torrent Power</td>
<td>Torrent Power Ltd., Ahmedabad</td>
</tr>
<tr>
<td>11</td>
<td>MPSE</td>
<td>MPS Electrical Test Laboratory, L&amp;T Ltd., Mysore</td>
</tr>
</tbody>
</table>


a) Test of insulation properties
   i) Impulse voltage test
   ii) AC High voltage test
   iii) Insulation test

b) Test of accuracy requirement
   i) Tests on limits of error
   ii) Test on starting condition
   iii) Test on no load condition
   iv) Test of Ambient Temperature influence
v) Test of repeatability of error
vi) Test of influence quantities
c) Test of electrical requirement
   i) Test for power consumption
   ii) Test for influence of supply voltage
   iii) Test of influence short time over current
   iv) Test of influence of self heating
   v) Test of influence of heating
iv) Test of electromagnetic compatibility
   i) Radio interference measurement
   ii) Fast transient burst test
   iii) Test of immunity to electrostatic discharges
   iv) Test of immunity to electromagnetic HF field
v) Test for climatic influences
   i) Dry heat test
   ii) Cold test
   iii) Damp heat cyclic test
vi) Test for mechanical requirements
   i) Vibration test
   ii) Shock test
   iii) Spring hammer test
   v) Protection against penetration of dust and water
   vi) Test of resistance to heat and fire

However, the purchaser reserves the right to demand repetition of some or all the type tests in the presence of Purchaser's representative. For this purpose, the bidder should indicate unit rates for carrying out such type tests. These test charges shall not be taken into consideration for bid evaluation.

9.04 Tests Before Dispatch:
The AC static HT trivector meter shall be subjected, at the manufacturer's works before dispatch, to the following tests as per ISS / IEC / CBIP Publication No. 304 described in clause No. 2 of the specification.

**ACCEPTANCE TESTS ON EACH UNIT AS PER RELEVANT STANDARD NO. IS 14697–1999/ IEC 60687-2000 / CBIP PUBLICATION NO. 304 / IS - 9000:**

i) AC Voltage test

ii) Insulation resistance test

iii) Tests of limits of errors

iv) Test of meter constant

v) Test of starting condition

vi) Test of no load condition

vii) Repeatability of error test

viii) Test of power consumption

9.05 Tests On Bought Out Items:

Tests are not required to be performed on bought out accessories at the works of the meter manufacturer. Furnishing test certificates of such bought out accessories from the original equipment manufacturers shall be deemed to be satisfactory evidence. Inspection of the tests at Sub – contractors' works will be arranged by the supplier whenever required.

9.06 Routine / Acceptance Tests:

All acceptance tests as specified at clause No. 9.04 shall be got conducted in the presence of Purchaser's representative as per relevant standards described in clause No. 2.0 of the specification. The following additional tests shall also be carried out on one meter of each type from each lot offered for inspection as per relevant standards on the selected samples.

- Shock test
- Vibration test
- Magnetic induction of external origin and
- Verification of temper and fraud detection features and values as per specifications and subsequent agreement between the supplier and purchaser.

Note: Where testing facilities do not exist at the supplier's works for shock and vibration testing as per relevant standards, these two tests may be carried out in accordance with the provisions of IS: 13010 with latest amendments.

a) All routine tests as stipulated in the relevant standards and described in clause No. 2.0 of the specification shall be carried out and routine test-certificates / reports shall be submitted to the purchaser for approval and also placed inside individual meter packing.
b) The recommended sampling plan and the criteria for acceptance of lot offered for inspection shall be as per annexure E of IS-14697 / 1999 for the meters covered in this specification.

9.07 Tests At Site:

The Purchaser reserves the right to conduct all tests on the meters after arrival at site and the Contractor shall guarantee test certificate figures under actual service conditions.

The supplier should furnish detailed write up for the procedure to be adopted for error testing of the meters in the laboratory and at site/field.

10.0 INSPECTION:

All the tests (as mentioned at clause 9.4) and inspection shall be made at the place of manufacturer unless otherwise specially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer(s) representing the purchaser all reasonable facilities without charges, to satisfy himself that the material is being furnished in accordance with this specification. The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The inspection may be carried out by the purchaser at any stage of manufacture / before dispatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material (s) is /are found to be defective. The bidder shall keep the purchaser informed in advance about the manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items.

The bidder shall give 15 days (for domestic supplies) / 30 days (in case of foreign bidders) advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine test. The inspection charges would be to the purchaser’s account.

Note for foreign Bidder:

The bidder shall indicate the name(s) of reputed inspection agencies and their inspection charges clearly for each lot. The inspection charges will be borne by the purchaser. However, the purchaser reserves the right to appoint at its cost any inspection agency to carry out the inspection.

11.0 QUALITY ASSURANCE PLAN:

The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

a) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, and the list of tests normally carried out on raw materials in presence of Bidder’s representative and copies of test certificates.

b) Information and copies of test certificates as in (a) above in respect of bought out accessories.
c) List of manufacturing facilities available.

d) Level of automation achieved and list of areas where manual processing exists.

e) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.

f) List of testing equipment available with the bidder for final testing of equipment specified and test plant limitations, if any, vis-à-vis the type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in a separate schedule of deviations from specified test requirements.

g) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser:

i) List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished alongwith offers.

ii) Type tests certificates of the raw materials and bought out accessories if required by the purchaser.

iii) Quality assurance plan (QAP) with hold points for purchaser’s inspection. The quality assurance plan and purchaser’s hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

h) The contractor shall operate systems which implement the following.

i) Hold point: A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals or organizations. The purchaser’s written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

ii) Notification point: A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

i) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing, if required by the purchaser and ensure that quality assurance requirements of this specification are followed by the sub contractors.

j) The quality assurance plan consists of the quality systems and quality plans with the following details:

1. Quality system:
   - The structure of the organization
   - The duties and responsibilities assigned to staff ensuring quality of work
   - The system for purchasing, taking delivery and verification of materials
   - The system for ensuring quality workmanship
   - The system for retention of records
   - The arrangements for the Contractor’s internal auditing.
A list of administration and work procedures required to achieve and verify contract’s quality requirements. These procedures shall be made readily available to the Inspecting Officer for inspection on request.

2 Quality plans:
- An outline of the proposed work and programme sequence.
- The structure of the Contractor’s organization for the contract.
- The duties and responsibilities assigned to staff ensuring quality of work.
- Hold and notification points.
- Submission of engineering documents required by the specification.
- The Inspection of materials and components on receipt.
- Reference to the Contractor’s work procedures appropriate to each activity
- Inspection during fabrication/construction
- Final inspection and test

12.0 DOCUMENTATION:
All drawings shall conform to International Standards Organization (ISO) ‘A’ series of drawing sheet / Indian standards specification IS – 656. All drawings shall be printed and soft copy in the form of CD(s) shall be supplied. All dimensions and data shall be in S.I. units.

The bidder shall furnish the following drawings and documents alongwith bid:

a) Two sets of drawings showing clearly the general arrangements, fitting details, electrical connections, etc.

b) Technical leaflets (User’s manual) giving operating instructions for the meter.

The successful bidder shall be required to furnish the following drawings and documents at the time of supply of the meters.

a) Eight sets of operating manuals / technical leaflets shall be supplied to each consignee for the first instance of supply.

b) One set of routine test certificates shall accompany each dispatch consignment.

c) The acceptance test certificates in case of pre – dispatch inspection or, in cases where inspection is waived, routine test certificates duly approved by the purchaser.

13.0 PACKING & FORWARDING:

a) The equipments shall be suitably packed in order to avoid damage or disturbance during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of dust and moisture and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton shall be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning, if considered necessary. The cases may then be properly sealed against accidental opening in transit. The packing case shall be marked to indicate the fragile nature of the contents.

b) The following information shall be furnished with each consignment:

i) Name of the consignee.
ii) Details of the consignment.

iii) Destination.

iv) Total weight of consignment.

v) Sign showing upper / lower side of the crate.

vi) Sign showing fragility of the material.

vii) Handling and unpacking instructions.

viii) Bills of materials indicating contents of each package and spare materials.

14.0 FURNISHING OF SAMPLES:

a) One No. sample meter of each rating, alongwith all associated software, shall be supplied by the bidder to the Purchaser along with type test certificates as per clause No. 6.0 of the specification with the bid for checking and testing in our Meter Testing Laboratory at Jaipur for routine / acceptance tests to ensure that offered meter meets the requirement specified under clause 5 of the specifications. It shall be the responsibility of the bidder to get the sample meter tested in his presence at our testing laboratories 15 days before opening of the bid. In case of failure to do so, the bid shall be rejected.

b) The details of logic and threshold values for various kinds of tampers as proposed and incorporated by the bidder in their meter samples shall be furnished along with the meter sample(s). The sample(s) should be duly labeled and with full address of the firm with tender enquiry number and date thereupon. Sample(s) should be handed over personally or sent by post well before due date of tender opening (techno – commercial offer). Sample shall not be received against RR or through G/R. After finalization of the tender, the unsuccessful bidder(s) will collect their sample(s) so submitted otherwise department does not hold itself responsible for safe custody of sample(s) so received. The offer received without sample(s) is liable to be ignored.

c) The successful bidder shall supply one No. meter of each type & rating identical to the ones to be supplied along with all associated software, within one month from the date of contract agreement. The sample(s) will be got tested at the discretion of the purchaser at any of the Indian standard laboratories. All the testing charges shall be borne by the purchaser, but in case of failure of the meter to pass the tests, the same will be recovered from the bidder. The bidder can commence the supply only after approval of sample. The unsuccessful type testing will render the contract to be cancelled.

d) Tests to be conducted:

i) Starting condition test.

ii) Power consumption test.

iii) Repeatability of error test.

iv) Accuracy requirements.

v) Voltage variation test (-30% to +20%).

vi) Tamper and fraud protection test:
Tests to prove compliance to this specification.

vii) AC and DC magnetic immunity test.

viii) Temper logic and threshold values.

ix) Capability of meter to transmit/communicate data as per specifications.

15.0 GUARANTEE:

The equipments supplied should be guaranteed for its performance for a minimum period of five (5) years from the date of commissioning or five and a half (5½) years from the date of receipt of last consignment in stores, whichever date is earlier. The equipment found defective within the above guarantee period shall be repaired / replaced by the bidder free of cost within one month of receipt of intimation.

The bidder shall also furnish an undertaking that there shall be no drift in the accuracy class of the meter for a minimum period of 10 years from the date of supply.

16.0 AFTER SALES SUPPORT AND TRAINING:

The supplier shall provide competent and timely after sales service support. The supplier shall also arrange to provide free training at the places as desired by the purchaser for use of meter / Computer Software, etc.
ANNEXURE V2-P3-3

TECHNICAL SPECIFICATION OF DATA CONCENTRATOR UNIT (DCU)

1.0 Application Requirement: Data Concentrator Unit (DCU) along with the suitable enclosure shall be placed in the control room in the Substation/Generating Plant. DCU is functionally required to acquire the meter data (ABT and TOD Type) and transferring the same to Data Control Center using communication system and AMR software.

2.0 General Construction

- DCU shall be a self contained, stand alone box with minimum 4 serial (RS232/485) ports for meter connection and with one RJ45 Ethernet 10/100 port.
- DCU should be flush mounted or surface mounted and to be supplied with suitable enclosure for installation in the control room. The enclosure shall be complete with the internal wiring and have all the necessary arrangement for the termination of various communication and power cables in the enclosure.
- DCU should not have any moving parts such as a hard disk, to ensure smooth and reliable operation for long term.
- The DCU shall be normally powered from the station battery backup supply rated at 110/220 VDC.
- DCU should have protection against entry of dust.
- Substantial EMI (Electro Magnetic Interference) and ESD (Electro Static Discharge) will be present at DCU site, effect of which shall be duly considered while designing the system. Performance of the overall system shall not be hampered by such interferences. EMI / ESD tolerance shall comply with IEC 61850-3 standard.
- DCU should be able to operate in environment with temp up to 50°C and humidity up to 90% without any significant effect on its performance.
- The mechanical design and construction of each unit sub-assembly shall be inherently robust and rigid under various conditions of operation, adjustment, replacement, storage and transport.
- DCUs shall also withstand without any damage or mal-operation reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. They shall have an IP-50 category dust-tight construction, and shall be capable of satisfactory operation in an indoor, non-air conditioned installation.

3.0 Local Display and LEDs

LEDs for status like power on, communication activity etc should be provided on the face of DCU.

The DCU should have a web server in order to give web based display of DCU dash board displaying all status, logs of activities, logs of alarm etc should be provided which shall be accessible from local PC as well as on MDAS.

4.0 Communication with MDAS

Entire project has to be primarily based on GPRS/3G network and OPGW where ever available. However in case GPRS/3G network is not available at
any location, then any available communication service like DSL/VSAT may be used for communication with MDAS.

Communication system should meet following requirements:-

- All communication between DCUs and MDAS should be through secured Virtual Private Network (VPN) tunnel (encrypted data) which shall be transparently managed between each DCU and the MDAS.
- For communication with MDAS, each DCU should be provided with Ethernet port. This is needed even for substation that presently does not have OPGW since OPGW is likely to be added in the future. For locations that does not presently have OPGW, built-in GPRS/CDMA modem capable of transferring the data to MDAS using TCP socket communication using DLMS/COSEM as well as SFTP protocols. In both cases there shall be no requirement to assign public static IPs to this GPRS device.
- A fixed public IP shall be provided for the internet landing point at central location where MDAS to connect the GPRS/3G network to MDAS.
- Transfer of data from DCU to MDAS should be on TCP/IP
- The DCU should be able to run the meter protocol drivers locally to read each type of meter and transfer them to the Control Centre. The DCU must support DLMS/COSEM (HDLC & TCP) as well as Modbus to communicate with meters.
- DCU should be capable of GPRS/3G operating at 900, 1800 2100 MHz, should support both Data and SMS transmission. It should have both GSM and GPRS/EDGE/3G features
- DCU should support TCP, UDP, HTTP, FTP, SMTP, Max.

5.0 DCU Functional Requirement

Data Collection Unit (DCU) is to function as gateway between central data collection system (MDAS) and energy meters installed at DCU location. DCU shall have following functions:-

- Providing energy data and status to MDAS.
- Acquiring energy data and status from energy meters.
- Providing energy data and status to local computer at site.

Status means data of healthiness status of DCU & Communication channel and any status given by meter.

1.1 Providing Energy Data and Status to MDAS

Every DCU should have at least one LAN port for connecting the DCU to the OPGW and substation existing local operator work station. OPGW network provided in various substations is connected to the station LAN to provide remote connectivity to MDAS.

For locations that are presently without OPGW interface DCUs shall be provided with built-in modems in order to have connectivity over GPRS/CDMA with MDAS.

All communication between DCU and MDAS should be on secure VPN and it should be encrypted. DCU must support interoperable communication protocol
IEC 62056-46, 47, 53, 61, 62 (DLMS /COSEM) to exchange data with Data Acquisition Software at MDAS. DCU shall act as DLMS server to supply data to MDAS as per the object models defined in IEC 62056-61.

DCU shall accept following commands from MDAS and should function as per the command:

- Energy data collection from energy meters.
- Acquiring status and alarm form energy meters.
- Modification of DCU Configuration.

1.2 Energy Data Collection.

DCUs shall collect energy data, store and transfer the same to MDAS as per schedule and on demand. DCU should be able to collect data from all or selected energy meters for the selected period and transfer the same to MDAS. DCUs should have option to implement protocols of existing meters at various locations included in the scope of this AMR system. In future, all new meters will be compatible with DLMS/COSEM protocol, therefore to ensure interoperability with, the DCUs supplied should support DLMS/COSEM client driver. The vendor shall demonstrate the DLMS/COSEM interoperability during technical evaluation.

Each meter has a unique identification number and each meter location has unique identification code. DCU shall collect data from a single or group of meters based on meter number or meter location code.

In Case of failure in communication with DCU at meter end or between DCU & MDAS suitable diagnostic tools to identify the reason of communication failure such as outage, GPRS Service availability etc. and accordingly send alarm / signal to the DCU / MDAS shall be provided. The tool shall be capable of detecting such failures and initiate action for collection / transfer of data as & when communication is restored automatically. DCU must also have data storage for storing meter data for 30 days. This memory shall be over and above the memory required for proper functioning of AMR.

5.3 Status Data Collection

DCUs shall collect periodically all energy meters connected to it for status or any alarm etc. Any change in status or alarm shall be reported to MDAS immediately.

DCUs shall acquire connected energy meter details like meter identification number, make, CT/PT ratio if any etc periodically as well as whenever it is powered on (Meter or DCU). Any modification activity like change in meter number, CT ratio etc shall be reported to MDAS.

DCUs shall be self monitoring for events such as, communication disconnection, and disconnection from energy meters and report the same to MDAS immediately.

DCUs should have non volatile memory for storing status data of energy meters duly time stamped, details of connected meters like make, meter number, status change. Non volatile memory should be able to store such data
for at least (1) one month in round FIFO buffer.

Whenever communication is restored, DCU should send the Data to MDAS in incremental manner to avoid overlap of Data.

5.4 DCU Configurations change

Each DCU should have a unique identification number normally not required to alter at site.

DCUs should accept and respond command for making configuration changes in DCU like periodicity of energy data/status data collection. For each configuration change, DCU should respond with task successful or failure message to MDAS. Configuration commands from MDAS may be in the form of single command or multiple commands from the configuration tool. DCU should accept and make changes in configuration through SMS from MDAS as well as data on GPRS/3G. DCU should receive the configuration command from MDAS on same channel used for transfer of data to MDAS.

DCUs should store all configuration data locally in a non-volatile memory. All change to configuration should be saved in the local memory and only after receiving a specific update command from MDAS, the saved configurations should come into effect. However, any other functionality should not get affected during accepting and responding to configuration commands from MDAS. DCUs should log history of configuration changes up to 30 days for audit purpose, all history shall be also maintained in MDAS.

6.0 Acquiring energy and status data from energy meters (Connectivity to SEM)

DCUs are to be connected with local energy meters in multi drop connection to RS-485 port or TCP over Ethernet switch as required. Connection to the energy meters should be firm and secure from any unintended disconnection. It should be possible to change/update the DCU driver configuration from MDAS. DCUs should not send any command other than the command to read the energy data and status data. DCU shall have provision to be able to collect data from DLMS/COSEM compliant energy meters.

7.0 Providing energy data to local computer

DCUs should provide LAN port for communication directly with local personal computer, PC should be able to query energy data from selected or all energy meter by using web browser and institutive user interface. No special software should be required to be installed at local computer for this communication. All communication with local computer should be password protected. PC for data downloading at each DCU location is available at respective site.
ABT METER BOX
(04 NOS. ABT METERS)

LEGEND DETAILS

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METER BOX - TYPE A
(GENERAL ARRANGEMENT DRAWING)
ABT METER BOX
(02 NOS. ABT METERS)

LEGEND DETAILS

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METER BOX - TYPE B
(GENERAL ARRANGEMENT DRAWING)
TECHNICAL SPECIFICATION FOR GPS/GPRS MODEM

1. RF Power:

Maximum RF Power Output should be 2 W at 900 MHz (Class 4) and 1W at 1800 MHz (Class 1). The RF functionalities should comply with the GSM phase II/II+ compliant, EGSM 900/GSM 1800 recommendation.

Sensitivity: - GSM 900 : < -100 dBm
                 GSM 1800 : < -100 dBm

2. Communication Capabilities:

Modem should be Dual Band modem capable of operating at 900 and 1800 MHz GSM transmission. Modem should support both Data and SMS transmission. It should have both GSM and GPRS features.

3. Data Features:

Modem should support standard AT command set (GSM 07.05, GSM07.07) for settings of the modem

CSD Data transmission features:
Data circuit asynchronous and non transparent up to 14.4 Kb/s V.110 USSD Support

GPRS Data transmission features:
GPRS Class B Multi slot class 12 or class B Multi slot class 10 Packet channel support: PBCCH Coding Schemes: CS1 to CS4 compliant with SMG32

4. Interface/Cable:

The modem shall have interface facility to connect with the DCU by using the RS232 cable.

5. Power Supply to Modem:

The offered modems should be capable of operating on 110/220 V DC supply drawn from the transmission substation UPS backed DC source. The modem shall be suitably protected against voltage surges. VA Burden of the Modem should not exceed 5 VA during Data communication.

6. Antenna:

The Modem should have flexible external antenna to enable placement of the antenna at the location of strongest signal outside the DCU Cubicle. Modem shall have option for High gain antenna with 10dBi gain with screw mount/Wall mount arrangement for locations where the signal coverage is week

7. Functional requirements:

A) The Modem should act a completely transparent channel i.e. the Commands received from Data acquisition server should be conveyed to meter and data from meter should be conveyed to data acquisition server without any changes in the modem.
B) Auto Registration — This feature is required to ensure correct installation/ configuration of modem and auto-linkage to the DCU to which it has been attached. It helps bringing the data on first hit to the data center on installation.

C) Configuration of Modems — Remote, Local, Command over the Air & through SMS.

D) Outage Notification: - In the event of an outage, the modem should be able to initiate separate call or send SMS to predefined number to notify the outage event with data and time of occurrence and restoration.

E) Get status of Modem over SMS — User shall be able to get following status over SMS remotely. Software status, uptime, network range, current IP address, Device Registration status

F) Connection from Modem shall be over Secured tunnel using TLS1.2 or higher

8. Mechanical Specifications: -

A) Modem should be a compact model housed in metallic enclosure.

B) Environmental Specifications :-

The Modem shall meet the following environmental specifications: -
- Storage Temperature: -20 degrees to +70 degree Celsius
- Operating Temperature: -10 degrees to +60 degree Celsius
- Humidity: - 95% RH (Non - Condensing)

C) Sealing: - The modem cover and body should have arrangement for sealing. In addition to this, the SIM card holder cover should also have arrangement for sealing.

D) Operational Indicator: -

The Modem should have separate LED indications for transmit data, received data, carrier detects and Power ON, etc. to indicate Power on position and to indicate the availability of signal at the place of installation.
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<td>SCC 27.14</td>
<td>Liquidated Damages</td>
<td>Request to limit the LD to 5% milestone value for each milestone’s and not of complete contract value. A) Delay up to 14th of the prescribed period of delivery, successful installation and completion of work - 0.5% of milestone value B) Delay exceeding 14th but not exceeding half of the prescribed period of delivery, successful installation and completion of work - 1.5% of milestone value , C) Delay exceeding half but not exceeding34th of the prescribed period of delivery, successful installation and completion of work - 2.5% of milestone value D) Delay exceeding exceeding34th of the prescribed period of delivery, successful installation and completion of work - 5% of milestone value</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
</tr>
<tr>
<td>51</td>
<td>SCC - Page 95</td>
<td>Si No 5 GCC 9.7.3</td>
<td>Payment terms</td>
<td>Kindly change the payment terms to 70% during supply for hardware, 20% after commissioning and 10% during AMC period as 0.5% per quarter. For STOMS software 20% on SRS for the STOMS, 50% on installation and completion of software configuration, 20% on Go live and 10% during AMC period as 0.5% per quarter. This is needed to ensure cash flow for smooth execution and to avoid escalation in price due to a) finance cost and b) increased risk perception for the retention amount</td>
<td>Please adhere to the specification requirement</td>
</tr>
<tr>
<td>52</td>
<td>SCC - Page 96</td>
<td>Si No 5 GCC 9.7.3</td>
<td>Payment terms</td>
<td>100% of taxes on supply items shall be paid on delivery since the same is due at the supply</td>
<td>Please adhere to the specification requirement</td>
</tr>
<tr>
<td>53</td>
<td>SCC - Page 96</td>
<td>Si No 5 GCC 9.7.3</td>
<td>5.2 Installation and test reports for establishing the communication system between all the locations</td>
<td>5.2 Installation and test reports for establishing the communication system between all the locations on pro-rate basis (i.e. based on connected location months). Installation and test report shall be due only once, i.e. for subsequent quarters, the payment will be based on the tri party agreement between service provider(s), successful bidder and Reliance. Locations without GPRS connectivity shall be excluded and it should be treated separately on pro-rata basis</td>
<td>Please refer the Clause No. 2.1 (h), Part-I (Project) regarding the feasibility of the Communication System at each location, therefore all location shall be the locations found feasible during preliminary survey. As such no change is envisaged in the clause.</td>
</tr>
<tr>
<td>54</td>
<td>SCC - Page 96</td>
<td>Si No 5 GCC 9.7.3</td>
<td>6.1 SRS for the STOMS - 5% of the charges for the functional software of smart transmission operation Management system [i.e. B5 (BOQB2)]</td>
<td>Increase the 5% payment on milestone 6.1 SRS for the STOMS - 20% of the charges for the functional software of smart transmission operation Management system [i.e. B5 (BOQB2)]</td>
<td>Please adhere to the specification requirement</td>
</tr>
<tr>
<td>55</td>
<td>Annexure V2-F3-4</td>
<td>2.1 Industrial Grade Ethernet Switch (Type A)</td>
<td>No of Ports 8 port 10/100 Tx + 1 uplink 10/100 FX</td>
<td>Propose to increase the FO ports to 2 no's to enable Fiber optic communication link between multiple meter boxes with in 1 location</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
</tr>
<tr>
<td>56</td>
<td>Annexure V2-F3-4</td>
<td>2.2 Industrial Grade Ethernet Switch (Type B)</td>
<td>No of Ports 4 port 10/100 Tx + 1 uplink 10/100 FX</td>
<td>Propose to increase the FO ports to 2 no's to enable Fiber optic communication link between multiple meter boxes with in 1 location</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
</tr>
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<td></td>
<td>Annexure V2-F3-3</td>
<td>2.0 General Construction</td>
<td>DCU shall be self contained, stand alone box with minimum 4 serial(RS232/485)ports for meter connection and with one RJ45 Ethernet 10/100 port</td>
<td>Please clarify whether Ethernet port can be 10/100 FX (instead of RJ 45) to connect directly to Industrial switch in Meter box. Also clarify if serial port has to be configurable as to support both RS485 and RS 232</td>
<td>Please refer Clause No. 1.4 (iv) [Project], armored fiber optic cable shall be connected between the Industrial Ethernet Switch (FX port) and DCU installed in the control room, therefore Ethernet Port at DCU shall be Fiber Port. Yes. 4 Nos. of Serial Ports (RS-232/Rs-485) should be configurable as per functional requirements.</td>
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<tr>
<td>Sr. No.</td>
<td>Clause No.</td>
<td>Page No.</td>
<td>Clause</td>
<td>Bidder's Query/Comment</td>
<td>RVN Reply</td>
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<td>72</td>
<td>9.7.3</td>
<td>95</td>
<td>Payment terms</td>
<td>Request customer to amend the clause to interest free advance</td>
<td>Please adhere to the specification requirement</td>
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<td>Supply and erection payments shall be separated</td>
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<td>20% interest free advance for Supply, Services and Mandatory Spares</td>
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<td>For Supply inclusive of software supply (pro-rata basis)</td>
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<td>70% with 100% taxes and duties shall be paid upon delivery at site</td>
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<td>8% against commissioning</td>
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<td>2% against taking over certificate</td>
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<td>For Services</td>
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<td>70% with 100% taxes and duties shall be paid on pro-rata basis</td>
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<td>10% against commissioning</td>
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<td>Mandatory Spares</td>
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<td>60% with 100% taxes and duties shall be paid upon delivery at site</td>
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<td>73</td>
<td>27.1.4</td>
<td>101</td>
<td>LD</td>
<td>LD's shall be applied only on the unfinished scope and not on the whole scope. Moreover, it shall be applied only for the delays caused by activities of the contractor. Moreover, request to limit the LD to 5% milestone value for each milestone's and not of complete contract value. A) Delay up to 14th of the prescribed period of delivery, successful installation and completion or work - 2.5% of milestone value. B) Delay exceeding 14th but not exceeding half of the prescribed period of delivery, successful installation and completion of work - 1.5% of milestone value. C) Delay exceeding half but not exceeding 4/4th of the prescribed period of delivery, successful installation and completion of work - 2.5% of milestone value. D) Delay exceeding exceeding 3/4th of the prescribed period of delivery, successful installation and completion of work - 5% of milestone value</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
</tr>
<tr>
<td>74</td>
<td>6.10(b &amp; w)</td>
<td>354</td>
<td>A USB port which will be an integral part of meter and available at front side of meter covered suitably for seating purpose. This USB port shall support laptop for reading the meter data as an alternate media for CMRI meter reading</td>
<td>Bidder proposes, optical port for collecting data from meter to MRXLaptop. Data can be collected from meter through laptop with help of USB optical cable USB converter. Request customer to accept the same.</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
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<td>Bidder proposes, pulse output shall be provided through RS 485 which is more useful in case of AMR. Request customer to accept the same.</td>
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<td>75</td>
<td>7.3</td>
<td>388</td>
<td>3The meters should be provided with pulse output coincident with end of its demand period.</td>
<td>Bidder proposes, pulse output shall be provided through RS 485 which is more useful in case of AMR. Request customer to accept the same.</td>
<td>Agreed</td>
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<td>76</td>
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<td>2.0 Pre-implementation site survey</td>
<td>Propose to increase to 60 days (instead of 45 days) due to large geographically spread. 12 = T2 + T1 + 45 days</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
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<td>77</td>
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<td>B01 Q. Site Survey, 2.2 Hardware Quantity Assessment and Deployment Plan report - T2 = 10+ 45 days</td>
<td>Propose to increase to 60 days (instead of 45 days) due to large geographically spread. 12 = T2 + T1 + 45 days</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
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<td></td>
<td>Price Schedule</td>
<td>BOQ_55102.xls</td>
<td>B01 Q. - Items B4, B7, B8</td>
<td>Items B4, B7 not B8 should be moved to three separate schedules for proper accounting of contract value. B4 is paid by NGT directly to ISP and the bidder can not resell GPRS charges as per TRAI regulations. B7 is AMC which gets paid over 5 years. B8 is optional change management items.</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
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<tr>
<td>78</td>
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<td>Sample Meters submission and Type test requirement</td>
<td>We request you to consider submission of Sample meters and Type test reports before placement of order and not along with the bid</td>
<td>Please refer Appendix-I (Amendment/Corrigendum)</td>
</tr>
<tr>
<td>79</td>
<td>Annexe V2- P3-3</td>
<td>DCU</td>
<td>DCU shall be self contained, stand alone box with minimum 4 serial (RS232/485) ports for meter connection and with one Hubei Ethernet 10/100 port</td>
<td>Please clarify whether Ethernet port can be 10/100 FX (instead of RJ 45) to connect directly to industrial switch in Meter box. Also clarify if serial port has to be configurable as to support both RS485 and RS 232</td>
<td>Please refer replies at S. No. 57</td>
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<td>Annexure V2- p1.2</td>
<td>Comprehensive Maintenance Contract</td>
<td>Severity of GPRS communication failure is not specifically defined</td>
<td>GPRS network outage shall not be attributed to bidders failure</td>
<td>Please refer replies at S. No. 59 &amp; 60</td>
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<td>Page</td>
<td>Point</td>
<td>Description</td>
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<td>85</td>
<td>(V)</td>
<td><strong>STOM System Architecture</strong>&lt;br&gt;ABT meters shall be connected on Industrial Ethernet Switch on Copper RJ-45 (TX) ports using suitable switch cards. If more than two meter boxes are used the selected bidder shall ensure the connectivity between Ethernet switches. The armored Fiber Optic cable shall be connected between the Industrial Ethernet Switch (RX port) and DCU installed in the control room. Please clarify the specific need &amp; Min Length of fiber optical cable between DCU &amp; Ethernet switch. The Meteor Industrial Ethernet Switches are to be installed in the meter box in the switch yard and their distance from the DCU installed in the Control Room shall vary as per the optimized positioning of the Meter Box near to Instrument Transformer as well as voltage level of switchyard. The armored FO is proposed for this connectivity to cater for distance limitation of conventional ethernet cable, laying in the cable ducts and avoid possibility of any electromagnetic interference in the live switchyard. The distance between the DCU and ethernet switch is required to be accessed by bidder.</td>
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<td>86</td>
<td>(VI)</td>
<td><strong>Points</strong>&lt;br&gt;02GSM Modem (One Internal &amp; other External) with Different Service Provider&lt;br&gt;This is one of the typical requirement &amp; Never been Asked in any tender. PI elaborates this requirement. If this is for redundancy requirement – We would like to suggest either same should be in manufacturer/contractor scope to Maintain Communication requirement to meet SLA. This can be possible even with one Modem. Having 2 Modem will not have any technical Advantage except More loading on cost. Rajasthan is one of biggest State in India. Communication coverage by One or two service provider is not Possible. It Mean there will be More Number of Service provider in same project. It will be difficult to manage number of service provider at competitive rates. So Such requirement should deleted.</td>
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<td>87</td>
<td>(VII)</td>
<td><strong>Points</strong>&lt;br&gt;Installed ToD Meter data shall be interfaced/Communicated for preparation of Energy account&lt;br&gt;Installed TOD Meter of Different make is always tough task. Sharing of Protocol API will play a vital Role. We would like to suggest that all Non DLMS Meter should be changed to DLMS Meter. Board will facilitate Necessary API/protocol from manufacturer for integration as &amp; When required. Please refer reply at S.No. 102</td>
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<td>Page 88</td>
<td>Cl. 2.4 Page 21, Point (iii)</td>
<td>Communication System Requirement</td>
<td>Nigam is also in process of developing its own MPLS based network for various functional requirements using its own fiber optic network as well as leased network.</td>
<td>We understand that Board is in process of its Own MPLS Network same will be available after completion of project – Supply, Installation &amp; O&amp;M Period. The communication network based on MPLS is under process of planning and shall take time for actual implementation. Therefore, the bidder is requested to adhere the requirement of the specification.</td>
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<td>Therefore, as and when the ABT location comes on this network, Nigam shall have discretion to discontinue the communication services of service provider from the next billing month by giving written notice to service provider and successful bidder or may decide to continue any one/two wireless network as back-up channel based on criticality of the location and redundancy of Nigam’s communication channels.</td>
<td>Bidder is required to quote for complete Communication cost Supply + Installation + O&amp;M Period. During this period even if Board MPLS network start functioning Board will pay Necessary cost to contractor for Balance period because Competitive cost from Service Provider is already decided during Tendering Process. Any Financial Loss or Implication due to board MPLS Network if Applicable to contactor same will reimbursed by board.</td>
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<td>Page 89</td>
<td>Point (iv)</td>
<td>Project timeline and deliverables Project Completion Time Line</td>
<td>In the process of implementation and maintenance period the ABT locations may change or can be added or discontinued due to ill above, in such case Nigam shall have option to shift the existing connection to changed/new location or ask for addition of new connection on same rates, terms &amp; conditions.</td>
<td>Once Location of ABT Meter is changed it’s difficult for Contractor to analyse or Establish communication link at New Location because same is not considered dusting survey. So Any Location Change should not be covered in this RFP.</td>
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<tr>
<td>Page 90</td>
<td>Cl. 2.4 Page 21, Point (v)</td>
<td>Comprehensive Maintenance Contract System Availability Requirement 99%</td>
<td>There are approx 184 locations for Meter Installation in Rajasthan State Total 2.3 Man days require for one particular site. Request you to amend site survey timeline to 90-150 days.</td>
<td>Please refer Appendix-I (Amendment/Corrigendum).</td>
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<td>Project timeline and deliverables Project Completion Time Line</td>
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<td>Project timeline and deliverables Project Completion Time Line</td>
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**Measurements Instruments**

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<tr>
<th>Instrument Mounted on panel shall be semi flush type &amp; Back Connected</th>
<th>We understand that This Clause is Not applicable in Present RFP. Only Projection types Meter are to be provided. PL confirm.</th>
<th>The referred clause is from the General Technical Requirements, for this bid the specific requirements of meters as mentioned in Annexure V2-P3.1 shall apply.</th>
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**ABT Meter**

| l.6(a). | It shall support simultaneous communication over multiple ports | We understand that This Clause should be as per IS 15959- Priority shall be given to local (optical) port, as per IS-15959- CI 4.3 requirement of Simultaneous communication. Pls confirm. | Please refer Appendix-I, acceptable as per IS. |
| 5.10(a) & (c) | | | |

**DCU**

<table>
<thead>
<tr>
<th>2.0 General Constructional Requirement</th>
<th>Min 4 RS232/RS485 Port for Meter Connection &amp; with one RJ45 ethernet port</th>
<th>As per GTC of Document. Meters- ⊃ Copper Cable- ⊃ Industrial Ethernet Switch- ⊃ Ethernet Cable- ⊃ DCU- ⊃ GPRS modem.</th>
<th>The reply at S. No. 57 &amp; 98 be referred.</th>
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<td>Please clarify requirement of min Nos port</td>
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<td>Requirement</td>
<td>Description</td>
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<td><strong>97</strong> Communication Requirement</td>
<td>All communication between DCU &amp; MOAS shall be through secured VPN. Please clarify whether MPLS line (VPN) of two service provider is required. As already stated above MPLS Network should be preferred from one service provider. The communication shall be GSM as envisaged in the project. The specification provisions also covers the various communication channels which can be used, however the functional requirement is of secured data communication through encryption or by any other suitable technology.</td>
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<tr>
<td><strong>98</strong></td>
<td>Each DCU with Ethernet port for communication between DCU &amp; MOAS. It is contradictory from DCU requirement (one no Ethernet port). As it will be connected with Meters. And External &amp; internal Modems are requested for Communication between MOAS &amp; DCU through SIM cards. Pls confirm the requirement. In this project, presently it is envisaged that DCU ethernet port shall be used to connect the Industrial Ethernet switches, however the RS-232/RS-485 Ports shall be used for connecting the GSM modem, TGD Meters in the control room.</td>
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<td><strong>99</strong> Built-in GPRS modem for Communication</td>
<td>As per Clause 1.1 have GPGW network for connecting with MOAS, using DCU with in-built GPRS modem will attract extra cost an external modem can be used as per site survey where GPGW is presently not available. Pls Confirm. Please adhere to the specification requirements.</td>
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<td><strong>100</strong> Frequency of Data</td>
<td>There shall be no requirement of Static IP. Contradictory from requirement of VPN for Communication. Pls Confirm. As clarified above that GSM communication is envisaged in the project.</td>
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<td><strong>101</strong></td>
<td>Instant, Daily, Weekly, Monthly data. As nothing is defined about Data Frequency (Time Interval) in RFP. Pl provide. Please refer V2-P3-29 for MIS reports, the daily, monthly, yearly reports are defined for reference and will be finalized and approved in SRS as per requirements of other systems/ modules. The data acquisition/ frequency is to be matched to meet with these functional requirements.</td>
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<td><strong>102</strong> Integration of Existing SCAD System</td>
<td>This required Existing SCADA Player Clearance. We would like to state there will be MDM Signed between Utility, SCADA Player &amp; Successful Bidder for integration. Process Necessary Flow Chart, Process, and Architecture shall be shared &amp; Necessary Help should be provided to Successful Bidder as &amp; when required from SCADA Player III Integration Completion. Please refer Clause 1.0 of Annexure V2-P3-29 where it is defined that the suitable interface module is required to be developed for fetching the required data from the SCADA Historian API client. Necessary co-ordination as per Clause 2.6 of Project (Part-I, Vol-II) shall required to be done by successful bidder and Negam shall facilitate the exchange of information, if required.</td>
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<td><strong>103</strong></td>
<td>1.2(a) The bidder should have CM&amp;I Level 3 or higher for quality management and who has developed, supplied and implemented web-based application software for AST system having the capability to prepare UI. Account deviation settlement in at least one transmission utility of India during the last 7 years as on the date of bid opening. The software as above should have handled a minimum of 30 Nos. of Open Access Consumers and in satisfactory operation for a period of at least one (1) year as on the date of bid opening. The basic function of software is to capture data reliably from the meters as per defined schedule. So it does not matter whether the software is deployed for transmission utility or with distribution utility. So if the bidder has experience of supplying Meter Data acquisition software should be considered. We request your good office to amend this clause accordingly. Please adhere to the specification requirements.</td>
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### Schedule V2-P3-1 Clause 9.01 Type Tests

Clause No. 9.01 is amended as under:

9.01 The energy meters of offered make & model shall be fully type tested at NABL accredited Test Laboratories as per relevant standards described in clause No. 2.0 of the specification. The bidder must furnish two sets of type test reports in respect of AC static HT tri-vector meter of 0.2s accuracy class of both current ratings. These type tests must not have been conducted earlier than seven years from the date of opening of bid.

In case for the offered meter as above, type tests are older than 7 years as on the date of bid opening or any design/ features changes are made in the already type tested meter as above, the bidder shall furnish the undertaking with the techno-commercial bid along with DD / Pay order amounting to Rs. 05 lacs or equivalent bank guarantee from a Nationalized / Scheduled bank in prescribed per-forma at Appendix-II to furnish the successful type test in three months from the award of contract for offered type ABT meter. In case the bidder/ contractor fails in submitting the valid type test report in three months as above, Nigam reserves the right to invoke / forfeit their above bank guarantee / DD / pay order, other securities along-with cancellation of the order/ contract.

### Schedule V2-P3-2 Clause 1.0 Application Requirements

**Corrigendum:**

TTBs (to be supplied by Nigam) be read as TTBs (to be supplied by Contractor)

### Schedule V2-P3-4, Clause 2.1 Industrial Grade Ethernet Switch (Type-A)

**No. of Ports to be amended as:**

- **No. of Ports:** 6 port 10/100TX+ 2 Uplink 10/100 FX

### Schedule V2-P3-4, Clause 2.1 Industrial Grade Ethernet Switch (Type-B)

**No. of Ports to be amended as:**

- **No. of Ports:** 4 port 10/100TX+ 2 Uplink 10/100 FX

### Schedule V2-P1-2 Clause 3.0 Availability Computation of STOMS

**Formula for quarterly availability for total STOMS System is amended as under:**

Quarterly Availability for total STOMS System (D) (in %) = [(A x 1) + (B x 0.5) + (C1+C2+C3+.........)/ (N) x 0.25]/ 1.75