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Technical Specification for CT  
Operated A.C. Three Phase Four  
Wire Static Watt Hour Smart Meter  
of Accuracy Class 1.0 with separate  
Meter Box

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## 1. Scope of Supply

This specification covers the following for Three Phase Four Wire, CT Operated Tri-Vector Static Watt hour smart meters of accuracy class 0.5s with integrated/plug in communication modules with suitable meter box to house Three Phase Four Wire, CT Operated Tri-Vector Static Watt hour smart meter along with CTs.

- a) Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.
- b) The meter shall have bidirectional communication capability through any of the communication technologies defined in IS 16444.
- c) ISI Marked smart meters with provision of TOD (Time of Day) tariff, suitable for measurement of energy (kWh & kVAh) and demand (kW & kVA).
- d) The meter should have different Import and Export registers so that it can be used as net meter also with renewable generation resources.
- e) Any accessories / hardware required for installation, commissioning and operation for the meter.

## 2. Codes & standards

The meters covered in this specification shall confirm to the latest editions and amendments of the relevant applicable Indian/IEC standards and shall confirm to the regulations of local statutory authorities, unless specified separately elsewhere in this specification.

S No.	Standard	Description
2.1	Indian Electricity Act	IE Act 2003
2.2	CEA Metering Regulations: 2006	Installation and operation of meters with latest amendments.
2.3	CBIP Manual (Pub no.-325)	Standardization of AC Static Electrical Energy Meters
2.4	IS- 16444 (Part 2) : 2017	AC Static Transformer Operated Watt-hour Smart Meters, Class 0.2s, 0.5s, and 1.0s
2.5	IS- 14697: 1999	AC Static Transformer Operated Watt-hour Meters, Class 0.2s and 0.5s.
2.6	IS- 11448:	Application guide for AC Electricity meters
2.7	IS-15959 (Part 1): 2011	Data Exchange for Electricity Meter - Reading Tariff and Load Control - Companion Specification
2.8	IS-15959 (Part 2): 2011	Data Exchange for Electricity Meter - Reading Tariff and Load Control (Part 2)- Companion Specification for smart meter
2.9	IS15707:2006	Testing Evaluation Installation and Maintenance of AC Electricity Meters.
2.10	IS 9000	Basic Environmental testing procedure for electrical and electronic items.
2.11	IEEE 802.15.4 : 2016	Standard for Local and metropolitan area networks.
2.12	IEEE 1901-2010	Standard for Broadband Over Power Line Networks: Medium Access Control and Physical Layer Specifications.
2.13	IEEE 1901.2-2013	Standard for Low-Frequency Narrow band power Line Communications for Smart Grid Applications
2.14	IEC- 62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions : Metering equipment
2.15	IEC- 62053-21	Electricity metering equipment (A.C) - Particular requirements : Static meters for active energy (classes 1 and 2)
2.16	IEC- 61053-52	Electricity metering equipment (AC) - Particular requirements : Symbols
2.17	IEC 62053-61	Electricity metering equipment (A.C.) - Particular requirements : Power consumption and voltage requirements

2.18	IEC 62056-21	Electricity metering - Data exchange for meter reading, tariff and load control: Direct local data exchange
2.19	IEC 62056-5-3	Electricity metering data exchange- The DLMS/COSEM Suit: DLMS/ COSEM application layer
2.20	IEC 60068	Environmental Testing

In case of any conflict or discrepancy the order of precedence shall be

- (i) IS
- (ii) IEC
- (iii) CBIP technical report-325 (read with latest amendments).

In case of any difference between the provisions of these standards and the provisions of this specification, the provisions contained in this specification shall prevail.

**NOTE:** All kinds of tests, which are required for confirmation of above-mentioned standards, shall be carried out.

### 3. Climatic Conditions for Installation

The meters to be supplied against this specification should be capable of performing and maintaining required accuracy under extreme hot, cold, tropical and dusty climate and solar radiation typically existing in state of Rajasthan (India). The meter shall be required to operate satisfactorily and continuously under the following tropical climatic conditions

S. No.	Parameter	Value
3.1	Maximum ambient air temperature	55 °C
3.2	Maximum ambient air temperature in shade	45 °C
3.3	Maximum temperature attainable by the meter	60 °C, exposed to sun.
3.4	Minimum ambient temperature	(-) 5 °C
3.5	Average daily ambient air temperature	40 °C
3.6	Maximum relative humidity	95 %
3.7	Number of months of tropical monsoon condition	4 months
3.8	Maximum altitude above mean sea level	1000 meters
3.9	Average annual rain fall	10-100 cms
3.10	Maximum wind pressure	200 kg/sq.m
3.11	Isoceraunic level (days per year)	40
3.12	Seismic level (horizontal accn.)	0.30 g
3.13	Permitted noise level	45. Db

The weather of Rajasthan is semi-arid type. Temperatures remain comparatively on the higher end all around the year. Heavy lightning also occurs during June to September.

### 4. Supply/Installation System Data

S. No.	Parameter	Value
4.1	Type of Installation	Indoor/Outdoor
4.2	System	AC, 3 Phase - 4 wire
4.3	Rated Frequency	50 Hz ± 5%
4.4	System Neutral	Solidly Earthed

### 5. General Technical Requirements

S. No.	Parameter	Requirement
5.1	<b>Meter Type</b>	3- Phase, 4 wire CT Operated Tri-Vector Static Watt-hour Smart Meter, comprising of measuring elements, display, memory with pluggable bi-directional communication module all to be housed in meter. Pluggable communication module shall be interchangeable with another module of same communication

		technology or module with different communication technology, viz. RF mesh and GSM.
5.2	<b>Connection</b>	Transformer Operated
5.3	<b>Reference and operating Voltage</b>	Reference Voltage ( $V_{ref}$ ) – 240 Volt (Phase to neutral). Meter shall be operational with required accuracy from 60% of $V_{ref}$ to 120% of $V_{ref}$ . However, meter shall with stand with the maximum system voltage of 440 volts (for minimum 5 minutes).
5.4	<b>Base Current (<math>I_b</math>)</b>	-/5 Amps.
5.5	<b>Starting current</b>	0.2 % of base current (Phase or neutral)
5.6	<b>Operating Frequency</b>	50Hz $\pm$ 5%
5.7	<b>Reference Conditions for testing the performance of the meter</b>	$V_{ref}$ : 240 V $\pm$ 1 % Frequency : 50hz $\pm$ 0.3% Temperature : 27°C $\pm$ 2°C
5.8	<b>Accuracy Class</b>	0.5s shall comply accuracy requirements under IS 14697
5.9	<b>Meter constant</b>	Imp/ unit (Bidder to specify meter constant)
5.10	<b>Power Factor Range</b>	Zero lag to Zero lead
5.11	<b>Meter category</b>	Meter shall comply D3 category of IS 15959 (Part 2).
5.12	<b>Power Consumption</b>	Power consumption of the smart meter with integrated communication modules shall be as per IS 16444 (Part 2)
	<b>5.12.1 Power consumption in voltage circuit</b>	Meter shall comply clause 6.10.1.1 of IS:16444 (Part 2) – 2017
	<b>5.12.2 Power consumption in current circuit</b>	Meter shall comply clause 6.10.1.2 of IS:16444 (Part 2) – 2017
5.13	<b>Mechanical requirements</b>	Meter shall comply clause 12.3 of IS 13779.
5.14	<b>Calibration</b>	Meter shall be calibrated through software at factory and modification in calibration shall not be possible at site by any means or external influence. However, configuration of parameter allowed for field reconfiguration shall be possible through wired or Over The Air (OTA) communication.
5.15	<b>Insulation and Impulse test</b>	Meter shall comply with IS 13779.
5.16	<b>Minimum Insulation resistance</b>	Minimum Insulation resistance at test voltage 500+/- 50 V dc a) Between frame & current, voltage circuits as well as auxiliary circuits connected together: 5 M Ohm b) Between each current (or voltage circuit) & each and every other circuit.: 50 M Ohm
5.17	<b>Influence of supply voltage</b>	Meter shall comply requirement of clause no. 4.4.2 of IS 15884
5.18	<b>Short time over current</b>	Meter shall comply requirement of clause no. 4.4.3 of IS 15884
5.19	<b>Immunity to phase and earth fault</b>	Meter shall comply requirement of clause no. 9.6 of IS 13779
5.20	<b>Influence of Self Heating</b>	Meter shall comply requirement of clause no. 4.4.4 of IS 15884
5.21	<b>Influence of heating</b>	Meter shall comply requirement of clause no. 4.4.5 of IS 15884
5.22	<b>Environmental Condition</b>	Meter shall be suitable for environmental conditions as mentioned below

5.23	<b>Temperature Range</b>	Operation range: -10°C to 60°C Limit range of operation: -25°C to 60°C Limit range of storage / transport : -25°C to 70°C
5.24	<b>Relative Humidity</b>	0 to 96 %
5.25	<b>Resistance against heat and fire</b>	The terminal block and Meter case shall have safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per IS 13779.
5.26	<b>Resistance against Climatic influence.</b>	Meter shall comply requirement of clause no. 12.6 of IS 13779.
5.27	<b>Energy measurement</b>	Fundamental energy + energy due to Harmonics.
5.28	<b>kVAh Calculation</b>	Meter shall be programmed for "Lag only configuration" i.e. lead to be treated as unity PF for KVAh calculation.
5.29	<b>Initial start-up of meter</b>	Meter shall be fully functional within 5 seconds after reference voltage is applied to its terminals.
5.30	<b>Sleep Mode</b>	No Sleep mode required.
5.31	<b>Display</b>	Backlit LCD, minimum 8 digits.
5.32	<b>Software and communication capability</b>	a) The bidder shall supply software for wired (CMRI/HHU and laptop) and remote (preferably web based; for AMI) connectivity. b) The bidder shall also provide required training of usage of software free of cost.
5.33	<b>Communication Layer Protocol</b>	Should comply requirement of clause no. 9.3 of IS 16444 Part-1.
5.34	<b>Alternative data retrieval</b>	In case of meter damage, data stored in meter memory (NVM) should be retrieved using a jig. Bidder need to be provide such jigs free of cost (1 jig on each 10000 meters). Jig should be designed such that NVM can be plugged easily on it for data retrieval.
5.35	<b>Electromagnetic compatibility (EMC)</b>	Meter shall be type tested for electromagnetic compatibility. Meter shall comply requirement of clause no. 4.5 and 5.5 of IS 15884 Meter shall operate within guaranteed accuracy as per CBIP325 against electrostatic discharge, electromagnetic HF field and fast transient burst.
5.36	<b>Limits of error due to influence quantities</b>	Meter shall operate within guaranteed accuracy as per IS 13779/ IEC62053-21/ CBIP325 for the accuracy class 1.0 (most stringent standard to be followed) under and after influence of following :- a) Current Variation b) Ambient Temperature variation c) Voltage variation d) Frequency variation e) 10% third harmonic in current f) Reversed phase sequence g) Voltage unbalance h) Harmonic components in current and voltage circuit i) DC and even harmonics in AC current circuit j) Odd harmonics in AC current circuit k) Sub harmonics in AC current circuit l) Continuous (DC) "stray" magnetic induction of 67mT+/-5%. m) Continuous (DC) "abnormal" magnetic induction of 0.27T+/-5%. n) Alternating (AC) "stray" magnetic induction of 0.5mT+/-5% o) Alternating (AC) "abnormal" magnetic induction of 10mT. p) External magnetic field 0.5 T q) Electromagnetic HF fields r) Radio frequency interference s) DC immunity test. Note: JVVNL reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.

## 6. Constructional Requirement

S. No.	Parameter	Requirement
6.1	<b>Meter Body</b>	a) Base body and top cover shall be made of UV stabilized, unbreakable high grade flame retardant insulating material of good dielectric and mechanical strength with FV0/V0 inflammability level. b) Base body shall be opaque. c) Top cover shall be transparent or opaque/translucent with viewing window. d) Usage of equivalent material shall be with prior approval of JVVNL. e) Top cover and base should be ultrasonically welded. f) Meter body shall be sealed in such a way that opening of meter base and cover is not possible without breaking the seals. g) Thickness of meter body (Base and Terminal cover) shall be 2mm minimum. h) Only unidirectional screws to be used on meter cover wherever required.
6.2	<b>Terminal Block</b>	a) The terminal block shall be moulded type made of non-hygroscopic, flame-retardant material having good dielectric and mechanical strength. b) The moulded terminal block shall be made from best quality phenol formaldehyde/Poly carbonate conforming to IS:13779-1999 (latest amended) having adequate insulating properties and mechanical strength with brass inserts for connecting terminals. c) The terminal block should satisfy all the conditions specified in IS:13779 and IEC 62052 - 11. The material of the terminal block should fulfil the requirement of following tests: <ul style="list-style-type: none"> <li>• The flame retardant rating of V0 as per UL 94 testing.</li> <li>• The glow wire test for temperature of 960°C. as per IS:11000 (Part 2/Sec.1) or IEC 60695-2-1.</li> <li>• Heat deflection temperature (HDT) test of 135°C. as per ISO 75 or ASTM D-648</li> <li>• Ball pressure test at 125°C. as per IEC 60335-1.</li> </ul> d) Terminal block shall be opaque. e) Usage of equivalent material shall be with prior approval of JVVNL. f) Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135°C and pressure of 1.8MPa. g) The terminals shall be designed to ensure adequate and durable contact such that there is no risk of loosening or undue heating. h) Terminal block shall be such that the risk of corrosion due to contact with other metal part is minimized. i) Electrical connections shall be designed such that contact pressure is not transmitted through insulating material.
6.3	<b>Terminal cover</b>	a) Material - UV stabilized transparent polycarbonate cover b) Provision of sealing at one point through sealing screw. c) The sealing screws shall be held captive in the terminal cover. d) The terminal cover shall be extended type (50 mm) with baffle wall above the cable entry base wall so that access to the terminals is not possible (even with thin metallic wire) without breaking the seal. e) Terminal cover should have provision for cable entry from bottom. f) Terminal cover shall have sufficient space for incoming and outgoing cable such that these can pass without stressing and damaging the terminal cover.

		g) Diagram of external connections should be embossed on clearly on inside portion of terminal cover. Meter terminals shall also be marked and this marking shall appear in the above diagram. Stickers of any kind will not be accepted.
6.4	<b>Terminals</b>	<p>a) Terminals shall be suitable for 25 Sq. mm aluminium cable.</p> <p>b) Two no's flat head screws and washers per terminal shall be provided</p> <p>c) Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % I<sub>max</sub>.</p> <p>d) Terminals shall be clearly marked for phase / neutral / outgoing etc. this marking shall appear in the connection diagram</p> <p>e) Clearances and creep age shall be as per IS 14967.</p> <p>f) The terminals and connections shall be suitable to carry up to 120 % of I<sub>max</sub> continuously</p> <p>g) The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.</p>
6.5	<b>Screws</b>	All electrically live screws shall be of brass/ nickel tin-plated. All other screws shall be electro plated.
6.6	<b>Fixing Arrangement</b>	<p>a) The meter shall have minimum three fixing holes, one at the top for mounting and two at the bottom, inside the terminal cover.</p> <p>b) The top hole shall be keyhole type on the back of the meter base so that hanging screw is not accessible after fixing of the meter and it shall not be possible to remove the meter from the hanging screw without removing the terminal cover and screws behind the terminal block cover.</p> <p>c) The lower fixing hole/s shall be provided under the ETBC. Any alternate better arrangement shall also be considered for acceptance.</p> <p>d) All the fixing holes shall be such designed that once the meter is mounted; the screw heads shall not be accessible.</p> <p>e) Manufacturer shall provide the appropriate fixing screws along with the meters.</p>
6.7	<b>Ingress Protection</b>	<p>a) IP 51 or better as per IS 12063, but without suction in the meter.</p> <p>b) Meter shall comply requirement of clause 6.9 and 12.5 of IS 13779.</p>
6.8	<b>Output device</b>	<p>a) Meter shall have flashing LED visible from the front to represent energy recording. Resolution shall be such that satisfactory accuracy test can be conducted at the lowest load in less than 5 minutes and starting current test in less than 10 minutes.</p> <p>b) Meter shall have provision on LCD for indicating data communication in progress.</p>
6.9	<b>Real Time Clock (RTC)</b>	<p>The meter shall have internal real time crystal clock to set date and time.</p> <p>The Real Time Clock (RTC) shall have long life (10 Years); it should be with permanent Non Rechargeable Battery.</p> <p>RTC shall have separate battery backup.</p> <p>Meter should have capability of Time synchronization through optical port/ remote communication with proper authentication.</p>
6.10	<b>Battery</b>	<p>Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Lithium thiol Chloride battery will be preferred. In case battery removal or total discharge, it should not affect the working &amp; memory of the meter.</p> <p>RTC shall have separate battery backup.</p>
6.11	<b>Memory</b>	Non-volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power.
6.12	<b>Self-Diagnostic feature</b>	<p>Meter shall have self-diagnostic for the following</p> <p>a) Date and RTC.</p> <p>b) Battery.</p> <p>c) Non-volatile memory.</p>

		d) Display
6.13	<b>Communication module of meter for AMI</b>	a) Smart meter shall have provision of one no of plug-in communication modules (NIC card). b) As per clause no 1.2(b) of IS 16444 Part -1. Meter should have provision of communication module with both the variant mentioned in IS 16444 Part-1. This module should be able to connect NAN or WAN (as per the plugged module RF or GSM) for two-way communication. c) Meter shall log communication module removal as an event.
6.14	<b>Meter Sealing Arrangement</b>	a) Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. b) Sealing should be in accordance with IS and CEA metering regulations with latest amendments. c) Approval shall be taken from purchaser for location of seals. d) In case of plug in communication module, sealing arrangement shall also be provided for the same.
6.15	<b>Manufacturer's / JVVNL Seals</b>	a) Manufacturer has to provide one polycarbonate seal on either side/front of the meter. b) Two hologram sticker seals on both sides of meter with logo of JVVNL/manufacturer and the polycarbonate and sticker seals having the same number as that of the meter Sr. No. c) One no. polycarbonate seal in loose condition to be provided for terminal cover of the meter. <b><u>The Serial Number of Meter, Polycarbonate Body Seal/ Sticker Seal and Loose Seal for Terminal Cover shall be same.</u></b>
6.16	<b>Seal record</b>	Record of all seals shall be forwarded to purchaser with each lot. The manufacturer will also provide the software in adequate numbers as per JVVNL's requirement for tracking and recording of seals.
6.17	<b>Name Plate and marking</b>	Meter should have clearly visible, indelible and distinctly marked nameplate in accordance with IS 16444 (Part 1) and clause no. 11 of this specification.
6.18	<b>Connection Diagram</b>	The connection diagram of the meter shall be clearly shown on the meter nameplate and shall be of permanent nature. Alternatively, connection diagram can be permanently embossed on the inside/outside portion of terminal cover.

## 7. Functional Requirement

S. No.	Parameter	Requirement
7.1	<b>Meter category</b>	Smart meter shall comply D3 category of IS 15959 (Part 2).
7.1	<b>Security</b>	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided.
7.2	<b>Encryption for data communication</b>	As per clause 7.1 of IS 15959 (Part 2)
7.3	<b>Encryption/ Authentication for data transport</b>	As per clause 7.2 of IS 15959 (Part 2)
7.4	<b>Key requirement and handling</b>	As per clause 7.3 of IS 15959 (Part 2)
7.5	<b>IP communication profile support</b>	Meter shall support TCP-UDP/ IP communication profile for smart meter to HES. Please refer clause 8 of IS 15959.
7.6	<b>Self-Registration</b>	a. Last mile mesh network must support auto-registration and self-healing feature to continue operation using easiest possible available route in case of failure of any communication device in the mesh.

		b. Meter once powered up with NIC card should be self-detected by RF network and its basic nameplate details & current readings should be transferred to HES.
7.7	<b>Instantaneous Parameters</b>	<p>Following parameters shall be continuously updated by the meter hardware/software as per internal sampling and computation time and last updated value shall be available for downloading as and when required.</p> <ul style="list-style-type: none"> <li>i. Real time clock date and time</li> <li>ii. Current R Phase</li> <li>iii. Current Y Phase</li> <li>iv. Current B Phase</li> <li>v. Voltage R Phase</li> <li>vi. Voltage Y Phase</li> <li>vii. Voltage B Phase</li> <li>viii. Neutral Current</li> <li>ix. Signed power factor, R Phase</li> <li>x. Signed power factor, Y Phase</li> <li>xi. Signed power factor, B Phase</li> <li>xii. Three Phase Power Factor, PF</li> <li>xiii. Frequency, Hz</li> <li>xiv. Apparent power KVA</li> <li>xv. Signed Active power, kW (+Import, -Export)</li> <li>xvi. Signed Reactive Power Kvar (+Lag, -Lead)</li> <li>xvii. Number of Power failures</li> <li>xviii. Cumulative Power off Duration in Min.</li> <li>xix. Cumulative tamper count</li> <li>xx. Cumulative billing count</li> <li>xxi. Cumulative programming count</li> <li>xxii. Billing date</li> <li>xxiii. Cumulative energy, kWh (Import)</li> <li>xxiv. Cumulative energy, kWh (Export)</li> <li>xxv. Cumulative energy, kVAh (While kWh Import)</li> <li>xxvi. Cumulative energy, kVAh (While kWh Export)</li> <li>xxvii. Maximum Demand, kW</li> <li>xxviii. Maximum Demand, kVA</li> </ul> <p>a. The parameters at S. No. (xviii) to (xxi) and (xxiii) to (xxvi) hold cumulative values at that instant from the date of manufacturing.</p> <p>b. All the above data shall be available for download as a separate entity.</p>
7.8	<b>Billing data</b>	<p>a. At the end of each billing cycle, meter shall generate and store in memory parameters as per provisions provided in clause no. 14 of IS 15959 (Part 2).</p> <p>b. Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).</p> <p>c. The current cycle billing parameters shall be readable as the values of the latest billing period, on demand. This shall be in addition to the last six billing period data, which shall be available in the profile buffer as the last six entries in the buffer.</p>
7.9	<b>Billing period reset/ MD reset</b>	24:00 Hrs of last day of each billing cycle. Default billing cycle is Monthly.
7.10	<b>Billing period counter</b>	Cumulative billing period counter since installation and available billing periods shall be provided as per clause 11.2 of IS 15959 (Part 1).
7.11	<b>Selective access of billing data</b>	By entry.
7.12	<b>Billing period reset mechanism</b>	As per clause 10 of IS 15958 (Part 1)
7.13	<b>MD Registration</b>	Block / 15 min sliding window with 30 min integration period as per requirement.

7.14	<b>Load survey Data</b>	<p>Following parameters shall be measured and recorded at the end of each 30 min interval for last 60 days.</p> <ol style="list-style-type: none"> <li>i. Real time clock date and time</li> <li>ii. Real time clock date and time</li> <li>iii. Current, R phase</li> <li>iv. Current, Y phase</li> <li>v. Current, B phase</li> <li>vi. Neutral Current</li> <li>vii. Voltage, R Phase</li> <li>viii. Voltage, Y Phase</li> <li>ix. Voltage, B Phase</li> <li>x. Block energy KWH- Forwarded/Import<sup>#</sup></li> <li>xi. Block energy KVARH- (Lag)</li> <li>xii. Block Energy, KVARH- (lead)</li> <li>xiii. Block energy KVAH- Forwarded/Import<sup>#</sup></li> <li>xiv. Block energy, KWh, Export<sup>*</sup></li> <li>xv. Block energy KVAH- Export<sup>*</sup></li> </ol> <ol style="list-style-type: none"> <li>a. Voltages and currents are average values during the block period time.</li> <li>b. Energies are consumption during the block period.</li> <li>c. All parameters are stored at the end of capture period.</li> <li>d. The time stamp shall be at the end of capture period.</li> <li>e. Selective access shall be provided as per clause 11.3 of IS 15959 (part 1).  <i># Import/Export only if configured as Net meter otherwise forwarded energy only.</i>  <i>* If configured as Net Meter.</i> </li> </ol>
7.15	<b>Daily load profile</b>	<p>Following parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 60 days.</p> <ol style="list-style-type: none"> <li>i. Real Time clock- date and time</li> <li>ii. Cumulative energy, kWh – Forwarded/Import<sup>#</sup></li> <li>iii. Cumulative energy, kVAh- Forwarded/Import<sup>#</sup></li> <li>iv. Cumulative energy, kWh – export<sup>*</sup></li> <li>v. Cumulative energy, kVAh- export<sup>*</sup></li> </ol> <ol style="list-style-type: none"> <li>a. Selective access shall be provided as per clause 11.3 of IS 15959 (part 1).  <i># Import/Export only if configured as Net meter otherwise forwarded energy only.</i>  <i>* If configured as Net Meter.</i> </li> </ol>
7.16	<b>Name                  Plate Detail</b>	<ol style="list-style-type: none"> <li>a. Meter SL no.</li> <li>b. Device ID</li> <li>c. Manufacture’s name</li> <li>d. Firmware version for meter</li> <li>e. Meter type- (3P-4W)</li> <li>f. Category- (D3)</li> <li>g. -/5 A</li> <li>h. Meter Year of manufacture- YYYY</li> </ol>
7.17	<b>Programmable parameters</b>	<p>Following parameters can be programmed remotely by HES and locally by CMRI via proper access writes. Every transaction shall be logged in non-volatile memory of the meter with date and time stamp.</p> <ol style="list-style-type: none"> <li>i. Real time clock, date and time</li> <li>ii. Demand integration period</li> <li>iii. Profile capture period</li> <li>iv. Single action schedule for billing dates</li> <li>v. Activity calendar for time zones</li> <li>vi. Load Limit (kW)</li> <li>vii. Enable/Disable load limit function</li> </ol> <ol style="list-style-type: none"> <li>a. Unit for demand integration period and profile capture period shall be in seconds. The demand integration period shall be 1800 s (Default) and programmable to 900 s. The profile capture period shall be 1800 s (Default) and programmable to 900s or 3600 s.</li> </ol>

		<p>b. On change of time zone settings, the on-going billing cycle data will be generated and a new billing cycle shall be commenced as per new activity calendar.</p> <p>c. Programming of any of the parameters shall increment the 'Cumulative programmable count' value.</p>
7.18	<b>TOD metering</b>	<p>a. Meter shall be capable of doing TOD metering for KWH, KVAH and MD in KW and KVA in three tariff registers programmable for 3 seasons and six time zones.</p> <p>b. Definition of time zones, seasonal profile and assignment of tariff registers shall be programmable remotely through HES and locally through CMRI with proper security as per provisions of CBIP-325.</p> <p>c. Above shall be implemented as per clause 9 of IS 15959 (Part 1).</p>
7.19	<b>Push Services</b>	<p>As per clause no. 6 of IS 15959 (Part 2) Smart meter is able to notify automatically event and messages to a destination client system in an unsolicited manner (without a request from a client) as per IS 15959 (Part 2).</p>
7.20	<b>Periodic push</b>	<p>a. Meter shall be able to push following instantaneous parameters to HES at predefined intervals.</p> <ol style="list-style-type: none"> <li>i. Device ID</li> <li>ii. Push setup ID</li> <li>iii. Real Time clock- Date and time</li> <li>iv. Voltage R Phase</li> <li>v. Voltage Y Phase</li> <li>vi. Voltage B Phase</li> <li>vii. Current R Phase</li> <li>viii. Current Y Phase</li> <li>ix. Current B Phase</li> <li>x. Current Neutral</li> <li>xi. Signed Power factor R Phase</li> <li>xii. Signed Power factor Y Phase</li> <li>xiii. Signed Power factor B Phase</li> <li>xiv. Signed Power factor Net</li> <li>xv. Apparent power KVA</li> <li>xvi. Active power Kw</li> <li>xvii. Cumulative Energy, Kwh (Import)</li> <li>xviii. Cumulative energy KVAH (Import)</li> </ol> <p>b. Other attributes as per IS 15959 (Part 2) i.e. Send Destination, Communication window, Randomization time interval, number of retries and repeat delay shall be decided in the event of manufacturing.</p>
7.21	<b>Event Push</b>	<p>a. Meter is able to report HES, the status change of any of the identified events like,</p> <ul style="list-style-type: none"> <li>• Earth Loading</li> <li>• Influence of permanent magnet or Ac/ DC electromagnet</li> <li>• Neutral disturbance- HF, DC or AC</li> <li>• Meter cover opening</li> <li>• Meter load Disconnected/ meter load connected</li> <li>• Power Outage</li> <li>• Power Restoration</li> <li>• Manual/ MRI reset</li> </ul>
7.22	<b>Firmware upgrade</b>	<p>a. As per clause 9 of IS 15959 (Part 2)</p> <p>b. Smart meter shall support remote firmware upgrade feature.</p> <p>c. Firmware upgrade shall be limited to the communication firmware only. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3.</p>
7.23	<b>Outage Management</b>	<p>The meter shall send abnormalities at the consumers' end like Power failure (Last Gasp), Power Restoration (First Breath) to HES.</p>
7.24	<b>First breath and last gasp</b>	<p>The meter should have "Last Gasp" and "First Breath" feature to facilitate sending alerts to the HES during fully powered off / On condition.</p>

		Shall comply with IS:16444 (Part-1).
7.25	<b>On demand readings</b>	On request from HES
7.26	<b>Schedule meter readings</b>	Programmable through HES

### 8. Anti-tamper and Fraud Detection Requirement

8.1	<b>Current Related</b>	<p>a. Occurrence and restoration of following current related events shall be logged in meter memory as per table A5 of IS 15959 (Part 2).</p> <p>b. For each occurrence event captured, the cumulative tamper count shall be incremented.</p> <p>c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1).</p>
8.2	<b>Power related</b>	<p>a. Occurrence and restoration of following Power related events should be logged in meter memory as per table A6 of IS 15959 (Part 2).</p> <p>b. Only Real clock (date and time) and event code shall be captured.</p> <p>c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1).</p>
8.3	<b>Power On/ Off</b>	Meter shall detect occurrence and restoration of power off if the phase voltage is absent more than a threshold period.
8.4	<b>Voltage related</b>	<p>a. Occurrence and restoration of following Voltage related events shall be logged in meter memory.</p> <p>d. For each occurrence event captured, the cumulative tamper count shall be incremented.</p>
8.5	<b>Low Voltage Logging</b>	Event shall be logged in memory along with Occurrence and restoration event data. Threshold should be below 180 Volts. Manufacturer should explain behavior of meter below 120V.
8.6	<b>Protection against HV spark</b>	Meter shall continue to record energy or log the event, in case it is disturbed externally using a spark gun/ ignition coil. Upto 35 KV meter should remain immune. Communication port shall also be immune upto 35KV with cover in place. Bidder should have valid test report from Sameer/ UL lab for the same.
8.7	<b>Others</b>	<p>a. Occurrence and restoration of following events shall be logged in meter memory as per table A8 of IS 15959 (Part 2).</p> <p>b. For each occurrence event captured, the cumulative tamper count shall be incremented.</p> <p>c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1).</p>
8.8	<b>Neutral disturbance</b>	Meter shall log all events when AC/DC/ Pulsating voltage is injected in neutral circuit especially when it can disturb the recording of energy. Manufacturer should specify the method of testing of Neutral disturbance.
8.9	<b>External Magnetic Interference</b>	<p>a. The meter shall either remain immune to tamper through application of external magnetic field (AC electro magnet or DC magnet) as per value specified in CBIP 325 or if the metering gets affected then meter shall record energy at I<sub>max</sub>, rated voltage and unity P.F. as per CBIP 325 and same should also be logged as event with date &amp; time.</p> <p>b. In case of abnormal permanent magnetic field, either meter shall remain immune or if the metering gets affected then meter shall record energy at I<sub>max</sub>, rated voltage and unity P.F and it should also be logged as event with date &amp; time.</p> <p>c. The meter shall be provided with built in logic/ indication and sensor to detect tamper beyond meter's magnetic immunity level and display of such occurrences. The meter accuracy or accuracy display shall not be affected by permanent magnetic field up to meter's magnetic immunity level.</p>

		<p>d. At the time of occurrence of magnetic tamper, meter should record tamper event with I<sub>max</sub>, rated voltage and unity P.F and at the time of restoration it should be logged with actual parameters</p> <p>e. Manufacturer should explain method of MD computation during magnetic interference.</p>
8.10	<b>Non rollover events</b>	<p>a. Occurrence of following non-rollover events shall be logged in meter memory as per table A9 of IS 15959 (Part 2).</p> <p>b. For each occurrence event captured, the cumulative tamper count shall be incremented.</p> <p>c. For these events, only date and time shall be captured.</p> <p>d. Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1).</p>
8.11	<b>Top cover open</b>	Meter shall detect opening of top cover and this event shall be logged. Detection and logging mechanism shall work even when the meter is de-energized. Logic shall be defined.
8.12	<b>I/C &amp; O/G Interchanged</b>	Meter should record forward energy within limits of accuracy class 1.0.
8.13	<b>Phase &amp; Neutral Interchanged</b>	Meter should record forward energy within limits of accuracy class 1.0.
8.14	<b>Event Logging</b>	Total number of events to be stored shall be minimum 20 for power On/ OFF event and not more than 50 for all other events in FIFO basis.
8.15	<b>Parameter Snapshot</b>	<p>Captured parameters mentioned above are to be captured when event occurrence and restoration is logged as per table A11 of IS 15959 (Part 2).</p> <ul style="list-style-type: none"> <li>i. Date and time of event</li> <li>ii. Event code</li> <li>iii. Current R Phase - instantaneous current.</li> <li>iv. Current Y Phase - instantaneous current.</li> <li>v. Current B Phase - instantaneous current.</li> <li>vi. Voltage R Phase</li> <li>vii. Voltage Y Phase</li> <li>viii. Voltage B Phase</li> <li>ix. Power factor R Phase</li> <li>x. Power factor Y Phase</li> <li>xi. Power factor B Phase</li> <li>xii. Cumulative energy- kWh</li> </ul>
8.16	<b>Tamper Indication</b>	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
8.17	<b>Tamper Logics</b>	<p>A logic sheet for tamper/ event detection and logging shall be submitted for purchaser's approval. Following details should be provided for each tamper in tabular form</p> <ul style="list-style-type: none"> <li>a. Detailed Tamper logic</li> <li>b. Threshold values</li> <li>c. Persistence times</li> <li>d. Restoration time</li> <li>e. Event count</li> </ul>

## 9. Meter Display

The measured value(s) should be displayed on a Liquid Crystal display (LCD) register. The display should have backlit capability for easy reading. When the LCD is placed at a constant temperature of 65°C for a period of 30 minutes in operating condition and 80°C for 30 minutes under de-energized / storage condition, it should not get deformed. Dot Matrix type LCD will not be acceptable.

9.1	<b>LCD Type</b>	STN Liquid crystal with backlit
9.2	<b>Viewing angle</b>	<ul style="list-style-type: none"> <li>a) Display should have viewing angle 35 degree up &amp; down from eye level.</li> <li>b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 m as well as at the height of 2 m.</li> </ul>
9.3	<b>Size of LCD</b>	Minimum 10X5mm
9.4	<b>LCD Digits</b>	Total 8 digits
9.5	<b>LCD language</b>	English

9.6	<b>Display mode</b>	<p>Following parameters should be displayed in Auto scroll with programmable interval</p> <table border="1" data-bbox="580 280 1353 651"> <thead> <tr> <th>Order</th> <th>Parameter</th> <th>Display time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>LCD Test</td> <td>5 Sec</td> </tr> <tr> <td>2</td> <td>Meter Sr. No.</td> <td>5 Sec</td> </tr> <tr> <td>3</td> <td>Date</td> <td>5 Sec</td> </tr> <tr> <td>4</td> <td>Time</td> <td>5 Sec</td> </tr> <tr> <td>5</td> <td>Cumulative kWh</td> <td>30 Sec</td> </tr> <tr> <td>6</td> <td>Current month MD</td> <td>5 Sec</td> </tr> <tr> <td>7</td> <td>Instantaneous Voltage</td> <td>5 Sec</td> </tr> <tr> <td>8</td> <td>Instantaneous Current</td> <td>5 Sec</td> </tr> <tr> <td>9</td> <td>Instantaneous Load KW</td> <td>10 Sec</td> </tr> </tbody> </table> <p><b>Meter with push button for manual display shall not be acceptable.</b>                      Permanent Display on LCD                      a) Supply indication                      b) Earth Load Indication ( If conditioned occurred )                      c) Meter cover forcibly open Tamper event.</p>	Order	Parameter	Display time	1	LCD Test	5 Sec	2	Meter Sr. No.	5 Sec	3	Date	5 Sec	4	Time	5 Sec	5	Cumulative kWh	30 Sec	6	Current month MD	5 Sec	7	Instantaneous Voltage	5 Sec	8	Instantaneous Current	5 Sec	9	Instantaneous Load KW	10 Sec
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7	Instantaneous Voltage	5 Sec																														
8	Instantaneous Current	5 Sec																														
9	Instantaneous Load KW	10 Sec																														
9.7	<b>Display indications</b>	<p>a) Appropriate indications/flags for all tampers and self-diagnostic features should be provided.                      b) Data Communication</p>																														

**10. Software and Communication**

10.1	<b>Communication Ports</b>	Communication port required in meter are as follows.
	<b>Optical</b>	Meter shall have one optical port. It should be compatible for data transfer over RS 232 standard
10.2	<b>NIC (RF Mesh / GSM GPRS)</b>	Meter shall have provision for pluggable and interchangeable NIC (RF Mesh/ GSM GPRS). That is in field based on requirement NIC of either type can be used without changing the meter.
10.3	<b>Integration</b>	It should be the responsibility of the bidder to ensure integration of meter into HES for both type of remote communication RF mesh or cellular.
10.4	<b>Software and support</b>	<p>a. The bidder shall supply following software including required training and manuals to use following software free of cost                      I. CMRI (Local communication): for HHU/CMRI Device and laptop. HHUs can be android or windows based.                      II. Base Computer Software (BCS) for viewing the data downloaded through HES/CMRI/laptop/HHU.                      III. Software for firmware upgrade from remote and mass deployment.                      IV. APIs for converting raw data in MIOS CDF format.</p> <p>b. Bidder shall ensure integration of software with any of JVVNL system during the life of meter free of cost. JVVNL will provide all the required support for integration activity.</p> <p>c. The bidder should provide DLMS compliance for communication with the meter at Optical port and at HES.</p>
10.5	<b>Software for local communication (HHU/Laptop)</b>	The manufacturer has to provide software capable of downloading all the data stored in meter memory through CMRI. The CMRI software shall work both on SANDS & Analogic CMRI devices. Along with software for traditional CMRI devices bidder shall also provide software for android or windows based HHUs.
10.6	<b>Base computer software</b>	Licensed Software with the following features should be supplied for free
	<b>10.6.1 Operating System</b>	BCS should be compatible for Windows XP, Vista, 7, 8 and 10.

	<b>10.6.2 Security</b>	System shall be password protected where user can login only if administrator provides login ID. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
	<b>10.6.3 Data access</b>	BCS shall be capable of accessing complete data stored in memory locally through CMRI/ serial port of PC and remotely through modem (RF/ GSM/ PSTN etc.) for connectivity to AMR. BCS should have polling feature with option of selecting parameters to be downloaded.
	<b>10.6.4 Database</b>	BCS shall maintain master database according to desired area, location, etc.
	<b>10.6.5 Reporting</b>	<ul style="list-style-type: none"> <li>a. BCS shall have option of user defined report generation in format of Excel, Word and CSV etc.</li> <li>b. BCS shall have capability to export data in ASCII format at desired location so that the same could be integrated with our billing data for processing.</li> <li>c. All the data available in the meter shall be convertible to user defined ASCII file format.</li> </ul>
10.7	<b>Training</b>	Manufacture shall impart training to JVVNL personnel for usage of software
10.8	<b>Port protection</b>	All ports shall be optically isolated from the power circuit.
10.9	<b>Operation</b>	Both optical port and NIC Card should work independently. Failure of one (including display) should not affect the working of other.
10.10	<b>Communication protocol</b>	As per IS 15959 (Part 2). Other protocols shall not be acceptable.
10.11	<b>Data transfer rate</b>	BCS and communication ports should support data transfer rate of 9600 bps (minimum).
10.12	<b>Data downloading cable</b>	<ul style="list-style-type: none"> <li>a. Optical port should be provided with 1-foot cable, having optical sensor at one end and D type female. 9 pin connector on other end. Cable should be suitable for downloading meter data. It should have a life of 5 years.</li> <li>b. Both meter and sensor should have mechanical arrangement, so as sensor can be fitted on meter without any tool and without any compromise on alignment and sensitivity</li> </ul>

## 11. Name Plate

Meter shall have a nameplate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. The manufacturer's meter constant shall be marked on the nameplate. In addition to the requirement as per IS, following shall be marked on the Name plate

11.1	Meter Serial number. Serial number shall be printed in black colour. Embossing is not acceptable.
11.2	Size of the digit shall be minimum 5X3mm
11.3	Bar code shall be printed along with serial number; The Size of Bar Code shall not be less than 35 x 5 mm. Stickers in any case will Not be accepted.
11.4	BIS registration mark (ISI mark)
11.5	'JVVNL' insignia shall be printed above LCD display.
11.6	Purchase order Number & Date
11.7	For the use of IPDS
11.8	Manufacturers name and country of origin
11.9	Model type / number of meter
11.10	Month & Year of manufacturing
11.11	Reference voltage / current rating
11.12	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
11.13	Meter constant
11.14	Class index of meter
11.15	Reference frequency
11.16	Warranty period
11.17	Communication technology with carrier frequency

## 12. Type Test

- 12.1 The bidders shall be required to furnish valid type test reports in respect of 3 phase static energy meter with optical port as per requirement of IS16444 (Part-2) - 2017 from CPRI or ERDA only. The type test certificate should not be older than three years as on the date of opening of techno-commercial bid. Date of conducting type test will be considered for calculating age of the certificate.
- 12.2 The type test certificates furnished shall be either in original or copy duly attested by notary.
- 12.3 The bids of only those bidders shall be considered to be meeting the type test criteria who furnishes complete type test certificates along with the bid as per above provision.

## 13. Quality Control, Inspection and Testing

- a) In case material/equipment is not found ready in good / acceptable condition by the representative(s) of the purchaser deputed for inspection to the extent of the quantity indicated in the inspection call with tolerance of (-) 10% or if the inspection is not got carried out by any reasons on account of the supplier an amount of Rs.7,500/- for the supplier's works located in Rajasthan, and an amount of Rs.15,000/- for the supplier's works located outside Rajasthan will become payable by the supplier on this account to the Accounts Officer (IT & RE), Jaipur Discom, Jaipur. All Acceptance tests as laid down in the ISS/IEC and this specification shall be carried out. The supplier shall provide all routine test reports for entire offered quantity of energy meters in CD to the inspecting officers.
- b) Following tests shall also be carried out as Acceptance tests by adopting methods specified in ISS:13779/IS:9000/IS:16444/ relevant IEC standard / CBIP 325 (latest amended) on Automatic meter test bench with electronic reference sub- standard of preferably 0.02 class accuracy or better.
  - i. AC voltage test.
  - ii. Test of meter constant
  - iii. Tests of limits of error clause. 11.11 of IS:13779 at 400 % Ib, 600% Ib and 800 % Ib at pf 0.5 lag, 0.8 lead & unity.
  - iv. Vibration Test( IS13010/1990/IS:9000)
  - v. Shock Test Vibration & shock test shall be carried out as acceptance test by adopting procedure laid down in related Standard and its latest amendments.
  - vi. Test of Voltage variation as per this specification.
  - vii. Test of no load condition at 70% and 120 % of rated voltage. The minimum test period shall be as per Clause 8.3.2 of IEC : 62053 21-2003.
  - viii. Test of DC components in AC circuit- The limit of variation in percentage error shall be 3.0% for class 1.0 meter as per Annex-D of IS: 13779/IEC 62053 -21 for phase & neutral circuit (s).
  - ix. Diode test
  - x. Accuracy test under anti tamper conditions mentioned at Cl. 7.6.
  - xi. Permanent magnet test (as specified in Clause 7.6d of this specification)
  - xii. Acceptance test of poly-carbonate seals shall be carried out as per specification of Poly-carbonate seals
  - xiii. The inspecting officer shall verify that no DC supply/ signal is given to reference meter during the DC injection test.
  - xiv. Display parameters shall be verified at the time of inspection.
  - xv. Test of application of abnormal Voltage/frequency generating devices (electronic gadgets) as per this specification.
  - xvi. Verification of continuous ultrasonic welding.
  - xvii. When the meter is placed in oven at a constant temperature of 65°C for period of 120 minutes during power ON condition, the character of LCD should not deform. After keeping the meter at a constant temperature of 80°C for period of 120 minutes during power OFF condition and when restored at normal temperature, the LCD should work satisfactorily.
- c) Number of samples for test from each lot shall be selected as per provision of IS. The criteria for selection of No. of samples and for acceptance of lot will be as under

<b>S. No.</b>	<b>Particulars of tests</b>	<b>Sampling plan for a lot of 1001 and above</b>	<b>Criteria for acceptance for lot</b>
1	HV. A.C. test & I.R. test. No load test and minimum starting current test	32 nos	As per clause C- 3.1 of ISS
2	All other acceptance tests as per cl.14 (b) above (except repeatability of error test, vibration test and shock test) in sequence to be mutually agreed between manufacturer and inspecting officer.	8 nos out of above 32 samples passing tests at s. no. 1.	As per clause C- 3.2 of ISS Annex.C
3	Repeatability of error test, vibration test and shock test, in sequence.	3 Nos. out of above 8 samples passing tests at s. no. 2	Each sample should pass all three tests

The sampling plan shall be as per IS:13779 except that maximum lot size may be read as 10,000 Nos. meters in place of 5,000 Nos. meters only for minimum offered quantity of 20,000 Nos. for Inspection otherwise the maximum lot size shall remain 5,000 Nos. meters. The sub-lot size shall be taken accordingly i.e. either 5,000 Nos. or 10,000 Nos. as applicable.

32 Samples shall be selected at random from the each sub lot of meters and acceptance tests as per relevant standards and additional acceptance tests as per technical specification shall be carried out on these samples.

In case of failure of samples of lot/ sub-lot in the test(s) detailed at clause No. (c) Above, the similar testing shall be repeated on fresh samples selected by the committee & fresh testing as mentioned at clause No. 12 (ix) Sr. No. 1 to 4 above shall be carried out. If the samples meet the requirement of above tests, the lot shall be accepted and if it fails consecutive second time, the entire quantity of respective lot/sub-lot shall be rejected and shall have to be replaced by the supplier at his own cost. Repeated failure/ poor results in the testing may render cancellation of order.

#### **14. Quality Assurance Plan**

The design life of the meter shall be minimum 20 years and to prove the design life, the firm shall have at least the following quality Assurance Plan:-

- i. The factory shall be completely dust proof.
- ii. The testing rooms shall be temperature and humidity controlled as per relevant standards.
- iii. The testing and calibrating equipment should be automatic and all test equipment shall have their valid calibration certificates.
- iv. Power supplies used in testing equipment shall be distortion free with sinusoidal wave- forms and maintaining constant voltage current and frequency as per the relevant standards.
- v. During the manufacturing of the meters, the following checks shall be carried out.
  - a. Meter frame dimensions tolerance shall be minimum.
  - b. The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.
  - c. The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.
- vi. The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. The 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, list of tests normally carried out on raw material in presence of bidder's representative and copies of test certificates.
  - b. Information and copies of test certificates as in (i) 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.

List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-a-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 schedule of deviations provided with the tender.

#### **15. Packing, Marking, Shipping, Handling and Storage**

Each meter shall be packed in superior quality three-ply corrugated cardboard carton or thermocol packing box. Such single cartons shall be additionally packed in five (5) ply corrugated cardboard carton accommodating 12-24 meters with meter boxes for easy transportation, storage & handling.

#### **16. Deviations**

- a) Deviations from this specification can be acceptable, only where the Seller has listed in his quote the requirements he cannot, or does not, wish to comply with and which deviations the Purchaser has agreed to in writing, before any order is placed. Bidder shall provide deviation list as per "**Schedule B**" for purchaser approval.
- b) In the absence of any list of deviations from the Seller, it will be assumed by the Purchaser that the Seller complies with the Specification fully.

#### **17. Drawing and Document Submission**

Detailed dimensional drawing & detailed leaflets showing clearly the dimensions & material for meter cupboards and its constructional features should be furnished with the tender offer.

#### **18. Delivery**

Commencement period 30 days from the date of receipt of purchase order and completion within 3 months at equal monthly rate from the date of approval of pre commencement sample.

#### **19. Training**

The bidder / manufacturer shall arrange for various training programmes for administration training, user training and trouble shoot training at free of cost with supported documents like system software manual, system operation manual. Training shall be imparted to at least 20 officers for user training and at least 5 officers for administrative training.

#### **20. Guarantee**

The Bidder/ manufacturer shall undertake a guarantee to replace meter up to a period of 60 months from the date of supply. The meters which are found defective/inoperative within the guarantee period, these defective/inoperative meters shall be replaced within one month of receipt of report for such defective/inoperative meters.

#### **21. Manufacturing Activities**

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make (as per Annexure-B) to ensure higher reliability, longer life and sustained accuracy. However, components of other reputed make also acceptable after prior approval of Purchaser. Purchaser shall carry out the verification of the components at manufacturer's works before offering material for inspection for every lot. The supplier is required to intimate purchaser whenever any lot is taken up for manufacturing/ assembly. The Purchaser reserve the right to waive off the verification of manufacturing activity.

- a. The manufacturer should use application specific integrated circuit (ASIC) or Micro controller for metering functions.
- b. The electronic components shall be mounted on the printed circuit board using latest surface mounted technology (SMT) except power components by deploying automatic SMT pick and place machine and re-flow solder process. No wave soldering or solder bath will be used. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter at least upto 10 years. Further, the Bidder should own or have exclusive access (through hire, lease or sub-contract) of the afore-mentioned facilities. Adequate documents regarding exclusive hire or exclusive lease shall be made available. In case of sub-contract, it shall be ensured that the sub-contractor is not carrying out sub-contracting for any other bidder in the above tender. The bidder shall indicate with the name and location of such facility along with an undertaking and certificate from the utility and any ambiguity on such a confirmation shall result in immediate disqualification of the bidder.

The above shall be verified during works inspection or material inspection also and if any ambiguity is found, it shall be considered as a breach of contract by the successful bidder. Bidders without in-house design, development and manufacturing facility as above or who are buying populated PCBs will not be considered as meter manufacturers.

The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

- c. All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and of tested quality. All parts, which are likely to develop corrosion, shall be effectively protected against corrosion by providing suitable protective coating.
- d. Quality should be ensured at the following stages
  - i. At PCB manufacturing stage, each board shall be subjected to bare board testing
  - ii. At insertion stage, all components should undergo testing for conforming to design parameters and orientation
  - iii. Complete assembled and soldered PCB should undergo functional testing using test equipment (testing jig).
  - iv. Prior to final testing and calibration, all meters shall be subjected to accelerated ageing test to eliminate infant mortality.
- e. The calibration of meters shall be done in-house.

## **22. Component Specification**

The components of the meters shall be as per specification (Annexure-'B')

## **23. Schedules**

The bidder shall fill in the following schedules and submit along with the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule "A" ... Guaranteed technical particulars

Schedule "B" ... Deviations List

The discrepancies if any between the specification and the catalogues and/or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

If it is observed that there are deviations in the offer in guaranteed technical particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

## **ANNEXURE – A: Technical Specification for Meter Box**

### 1. Scope

- This specification covers the design, manufacture, testing and supply of anti-corrosive, dust proof, rust proof, shock proof, vermin and water proof, U.V. stabilized and pilfer resistant meter boxes made of Glass reinforced, polyester sheet moulding compound (SMC) conforming to IS:13410:1992 (with latest amendment thereof) for installation on distribution transformers of various ratings.
- Meter boxes shall consist of two separate chambers, one suitable to accommodate LT TVM and other suitable for installation of 4 nos. single core, single ratio, ring type Current Transformers (CTs) of current ratios ranging from 100/5 A - 400/5A

### 2. CONSTRUCTIONAL FEATURES OF METER BOX:

- Meter Box shall be made of minimum 2.5 mm. thick Glass reinforced Polyester sheet moulding compound (SMC) conforming to IS:13410:1992 with latest amendments thereof.
- LT meter box shall contain two separate chambers. The upper chamber shall be suitable to house 3 phase 4 wire energy meter. The lower chamber of the box is intended for housing 04 nos. ring type LT CTs. Both the chambers of box shall be independent from each other.
- The appropriate size of cables from the secondary of distribution transformer shall pass through ring type LT CTs.
- If any portion of box is closed, it shall not be possible to approach it by opening the other portion and vice-versa. It shall be moulded in a single piece forming the body of the Meter Box and CT chamber with SMC lid/shed fitted with the base by two nos. concealed brass hinges.
- The concealed brass hinges shall be fitted with the meter Box body base and the cover rigidly in such a way that the same are neither visible nor accessible from outside, thereby making the Meter Box pilfer proof.
- The door/cover in closed position should house properly within collar of meter box/ body base, which shall also house the edges of the lid/cover so that no direct entry or access is possible. • The box should have a front door opening with a window provided with toughened glass of minimum 4.0 mm. thickness for viewing and taking meter reading.
- The meter box shall be of moulded type without any fabrication joint made by the process of hot press compression moulding.
- The body of the Meter Box shall have such construction that while installing on the grouted bolts of base-wall/ mounting bracket, the top surfaces of the box shall have little tapering shape frame centre towards both sides of the meter box so that easy flow of rainwater etc. is facilitated.
- The meter box should be anti-corrosive, rust-proof, dust-proof, vermin-proof, water-proof, UN, stabilized and pilfer resistant. The meter box becomes completely closed by providing locking arrangement in the shape of two nos. clamps.
- Clamp shall have separate holes of 1 mm. dia. each across the meter box body base as well as covers for both the chambers separately
- The meter box shall have four wall mounting bracket with proper screws to fix with the bottom base and provision for Four nos. holes each of 6 mm. dia.
- The meter box should neither melt nor become soft or distort when tested up to temperatures 2500C. ( As per IS 13360 part 6 sec 10 1992 by 'A' capillary tube method The thickness of these boxes shall not be less than 2.5 mm on all sides including floor. The box shall have 3 mm thickness on the tongue and groove area. The meter box cover shall have a groove to hold minimum of 2.5 mm Neoprene gasket.
- The tongue of the base shall ensure tongue, Groove and sealing arrangement against rainwater and dust entering inside the box. The box shall have its roof tapering down to both sides for easy flow of water.
- The boxes shall generally comply with the provision of IS: 14772:2000. The boxes shall be suitable for outdoor / indoor application. The box shall be with good workmanship. There should be a minimum of 25 mm clearance on all sides and 25 mm clearance on the front and 10 mm clearance on the back of the meter.

- Sufficient space should be available inside the meter box for making out-going connections of the leads with the terminal block of the meter.

### 3. MATERIAL OF METER BOX

- Material for construction of meter box shall be glass reinforced polyester sheet moulding compound (SMC) as per IS: 13410:1992 Grade S-1 with latest amendment thereof. Thickness of boxes shall be 2.5 mm from all sides. However, thickness of partition plate shall be 2.0 mm.
- The material of meter box should be anti-corrosive, rust proof, waterproof, shock proof and U.V stabilized.
- Material of meter box should not get soften on heating. (Heat distortion temperature should be above 1702 C.)
- The material of Meter box should be self-extinguishing as per IS: 4249 with latest amendment thereof.
- All MS parts of the meter boxes shall be anti-corrosive treated.

### 4. RATING PLATE:

Manufacturers should Screen Print the following information on each meter box.

- Name of Manufacturer
- Year of manufacturing
- Type of Meter
- PO NO with Date
- Meter Box Number
- JVVNL
- For the use of IPDS

**ANNEXURE – B: Component Specifications**

S.No.	Component	Requirement	Makes & Origin
1.	Current Element	E-beam/spot welded shunts shall be provided in the phase element and CT in the neutral. Alternatively, both the current elements (phase & neutral) shall have shunts with proper insulation. The meters should be with the current transformers/shunt as measuring elements.	Any make or origin confirming to IS-2705 and other make i.e. Redbourne Engg/Isabelle.
2.	Measurement of computing chips	The measurement or computing chips used in the meter should be with the surface mount type along with the ASICs.	Analog Devices, Cyrus Logic, AMS, Atmel, Phillips, SAMES, NEC, Texas Instruments, Teridian-USA, Maxim USA, Renesas.
3.	Memory chips	The memory should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, ST Hitachi or Oki, Teridian, Renesas
4.	Display modules	<ul style="list-style-type: none"> <li>a. The display modules must be well protected from the external UV radiations.</li> <li>b. The construction of the modules should be such that the displayed quantity should not be disturbed with life of display.</li> <li>c. The display should be clearly visible over an angle of at least a cone of 70°.</li> <li>d. It should be trans-reflective FSTN or STN Type industrial grade with extended temperature range.</li> </ul>	Genda, Haijing, Holtek, Bonafied Technologies Korea: Advantek, Truly Semiconductor, Success Hitachi, Sony, Tianma, RCL, Future S&T (Shenzen)
5.	Electronic Components	The active and passive component should be of the surface mount type and are to be handled & soldered by the state of the art assembly processes.	National Semiconductors, Atmel, Phillips, Texas Instruments, Toshiba, Fairchild, Murata, Rohm, Siemens. Hitachi, Oki, AVX or Ricoh. Samsung, Panosonik. Vishay, Yageo, DiotecPhycom, O N semiconductor, Koshin
6.	Battery	Lithium with minimum guaranteed life of 15 years.	Varta, Tedirun, Sanyo or National, Durocell, Maxwell-Hitachi, Panasonic and Mitsubishi, Renata, Elegance.
7.	RTC and Micro Controller	The accuracy of RTC shall be as per relevant IEC / IS Standards.	Phillips, Dallas Atmel, Motorola, Microchip. NEC or Oki. Renesas, Intersil, Analog Devices, Crystal:FRONTER ELECTRONICS, Roson Electronics.
8.	PCB	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	

Technical Specifications for 3 Phase 4 Wire, CT Operated Tri-Vector Smart Meter

9.	Communication modules	Communication modules should be compatible for the RS232 ports	National Semiconductors, Hitachi, Texas Instruments, Philips, HP, Agilent, Everlight, Fairchild
10.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instruments, Siemens, Agilent, Philips, Hp, Everlight
11.	Power supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected incase the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	
12.	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	

**SCHEDULE – A: Guaranteed Technical Particulars**

GUARANTEED TECHNICAL PARTICULARS OF THREE PHASE FOUR WIRE CT OPERATED TRI-VECTOR STATIC ENERGY SMART METERS OF RATING -/5A HAVING LCD BACKLIT DISPLAY AGAINST TN-71.

S. No.	Particulars	
<b>1.</b>	<b>Makers Name &amp; Company</b>	
	a) Meter Serial No.	
	b) Manufacturer Name	
	c) Firmware Version for meter	
	d) Firmware Version for communication module	
	e) Year of manufacturer	
	f) Software for smart meter remote configuration	
	g) Web Based Software for Meter Data	
<b>2.</b>	<b>Model</b>	
<b>3.</b>	<b>Type of Meter</b>	
<b>4.</b>	<b>System voltage with variations</b>	
<b>5.</b>	<b>Standard to which the meter conforms</b>	
<b>6.</b>	<b>Current</b>	
	a) Basic current (ib)	
	b) Minimum starting current	
	c) Current overloading capacity	
<b>7.</b>	<b>Frequency with variations</b>	
<b>8.</b>	<b>Humidity</b>	
<b>9.</b>	<b>Temperature</b>	
<b>10.</b>	<b>Altitude</b>	
<b>11.</b>	<b>Class of index</b>	
<b>12.</b>	<b>Accuracy</b>	
	a) Current range	
	b) Voltage range	
	c) Frequency range	
	d) Temperature range	
	e) PF range	
<b>13.</b>	<b>Demand &amp; integration Period</b>	
<b>14.</b>	<b>Specific Dynamic Range</b>	
<b>15.</b>	<b>Specified Working Range</b>	
<b>16.</b>	<b>Pulse output</b>	
<b>17.</b>	<b>Register (Electronic)</b>	
<b>18.</b>	<b>Internal Meter Multiplying Factor</b>	
<b>19.</b>	<b>Terminal Connection</b>	
<b>20.</b>	<b>Meter earthing</b>	
<b>21.</b>	<b>Power loss in each current circuit at basic current in VA &amp; watt</b>	
<b>22.</b>	<b>Power loss in each voltage circuit at reference in VA &amp; watt</b>	
<b>23.</b>	<b>Display device</b>	
	a) Type of display i.e. LCD	
	b) Character size of display digits	
	c) No. of display digits for data	
	d) No. of display digits for parameter identification	
	e) Life of display unit (guaranteed)	
	f) Method adopted for display overflow	
	g) Indication of healthiness of potential & current	
	h) Earth Load Indication ( if condition occurred )	
	i) Meter cover open Tamper Event	
	j) <b>Maximum Demand</b>	
<b>24.</b>	Parameters available	
	a) Integration period	
	b) <b>Provision for MD reset</b>	
<b>25.</b>	Communication driven reset	

	a) Auto reset at 24:00 hrs at the end of each billing cycle	
	b) Type of MD computation	
	c) <b>Display parameters in auto scrolling mode</b>	
<b>26.</b>	LCD Check	
	a) Real time clock - Date and Time	
	b) Cumulative Energy - KWH (I&E)	
	c) Cumulative KVAH (I&E)	
	d) KW MD (I&E)	
	e) Average monthly signed power factor (I&E)	
	f) Tamper count	
	g) <b>Load Survey Parameters for last 60 days</b>	
<b>27.</b>	Real Time Clock- Date & Time	
	a) Voltage	
	b) Current	
	c) Energy - KWH, KVAH (I&E)	
	d) Demand - KW MD	
	e) System Power Factor - PF	
	f) Net Energy - KWh	
	g) Net Demand - KW MD	
	h) <b>Programmable Parameters</b>	
<b>28.</b>	Real Time Clock - Date and Time	
	a) Demand Integration Period	
	b) Profile Capture Period	
	c) Single - action Schedule for Billing Dates	
	d) Activity Calendar for Time Zones etc.,	
	e) Time Zones script table	
	f) <b>MD integration</b>	
<b>29.</b>	Integration period of MD (Minutes)	
	a) Principle of operation	
	b) <b>Overall dimensions, weight &amp; drawing</b>	
<b>30.</b>	<b>Reference standards</b>	
<b>31.</b>	<b>No. of digits displayed</b>	
<b>32.</b>	<b>Parameters read out by MRI / HHU</b>	
<b>33.</b>	Meter serial number, Model, Make	
	a. All parameters as specified in the bid document	
	b. Load Survey data.	
	c. Tamper events details of at least 140 records (in and out) with date and time	
	d. Self-diagnostic details (Real time calendar, low battery)	
	e. <b>Communication interface available</b>	
<b>34.</b>	For calibration	
	a) For data transfer	
	b) <b>Non-volatile memory retention time in absence of power</b>	
<b>35.</b>	<b>Provision for connectivity ( RS 232)</b>	
<b>36.</b>	<b>Max error due to variation in</b>	
<b>37.</b>	Voltage Variation - 15% to + 10%	
	a) Voltage Variation - 40% to + 20%	
	b) Current 2% to 600% of rated basic current	
	c) Frequency - +/- 5%	
	d) Temperature - + 70c	
	e) PF (0.0 lag -UPF-0.0 lead)	
	f) <b>Anti-Tamper Features</b>	
<b>38.</b>	<b>Power Supply back up</b>	
<b>39.</b>	For sorting recorded values	
	a) For taking reading	
	b) For downloading data	
	c) <b>Measuring principle employed for</b>	
<b>40.</b>	KWH, KVAH	
	a) Maximum demand parameters	
	b) Power Factor	

	c) <b>Guarantee period offered for</b>	
<b>41.</b>	<b>Microprocessor</b>	
<b>42.</b>	Address in bits	
	a) Sampling rate	
	b) <b>Tamper and fraud proof provision for</b>	
<b>43.</b>	Meters	
	a) Software	
	b) <b>Sealing arrangement provided</b>	
<b>44.</b>	Meter body	
	a) Meter Terminal block	
	b) Communication Port	
	c) <b>Degree of protection against dust, moisture etc.,</b>	
<b>45.</b>	<b>Details of battery indication</b>	
<b>46.</b>	Guaranteed life of battery	
	a) Low battery indication	
	b) Internal battery	
	c) <b>Provision of real time clock</b>	
<b>47.</b>	<b>Self-diagnostic features</b>	
<b>48.</b>	<b>Software Requirement</b>	
<b>49.</b>	a) Meters ID, Time, Report dates as "HEADER" at the beginning of each type of data	
	b) Meter configuration consisting of the following : Meter data i.e., Serial No., Software version, Hardware version, Basic current, voltage, accuracy class & Pulse output	
	c) Software for Smart prepaid Metering, Billing, collection, Tariff, vending, POS, Database @ central server	
	d) Security for vending features.	
	e) Abnormal events occurrence data	
	f) Tamper data events, Voltage related , Current related, Power related, Transaction related, others, Non rollover events & control events	
	g) All display parameters values shall come in printout	
	h) Historical data of all cumulative parameters for previous 6 months @ reset	
	i) <b>Facilities for conducting acceptance test and routine test in factory with additional acceptance &amp; other acceptance tests.</b>	
<b>50.</b>		

Bidder's seal / signature -----

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number	
Email id	

**SCHEDULE – B: Deviations List**

Clause No.	Clause Description	Manufacturer's Reply
1		
2		
3		
4		
5		

Bidder's seal / signature -----

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number	
Email id	