Annexure - 1

Technical Specification for Smart Meters

Technical Specification for Single Phase WC Smart Meter

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Record of Revision

Item/Clause No.	Change in Specification	Reason of change	Approved By	Rev

1. Scope of Supply

This specification covers the following for Single Phase 240 V, 10A-60 A Static Watt hour smart meters of accuracy class 1.0 with plug in communication modules (RF mesh only and RF + Cellular technology) and integrated load control switches.

A. Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.
B. Any accessories / hardware required for installation and operation for the meter.

2. Codes and Standards

Materials, equipment and methods used in the manufacturing of above mentioned equipment shall conform to the latest edition/ of following

SL	Standard Number	Title
2.1	Indian Electricity Act	IE Act 2003
2.2	CEA Metering Regulations	With latest amendments
2.3	CBIP Manual (Pub no.-325)	Standardization of AC Static Electrical Energy Meters
2.4	IS- 16444 (Part 1)	AC Static Transformer Operated Watt-hour Smart Meters, Class 1.0 and 2.0 Part 1 Specification
2.5	IS- 13779	AC Static Watt-hour Meters, Class 1 and 2 – Specification
2.6	IS-15959 (Part 1)	Data Exchange for Electricity Meter - Reading Tariff and Load Control - Companion Specification
2.7	IS-15959 (Part 2)	Data Exchange for Electricity Meter - Reading Tariff and Load Control (Part 2)- Companion Specification for smart meter
2.8	IS- 11448	Application guide for AC Electricity meters
2.9	IEC- 62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
2.10	IEC- 62053-21	Electricity metering equipment (A.C) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
2.11	IEC- 62053-52	Electricity metering equipment (AC) - Particular requirements - Part 52: Symbols
2.12	IEC 62053-61	Electricity metering equipment (A.C.) - Particular requirements - Part 61: Power consumption and voltage requirements
2.13	IEC 62058-11	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
2.14	IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S,

		0,5 S, 1 and 2)
2.15	IEC 60736	Testing Equipment for electrical Energy meter
2.16	IS/IEC/TR 62051:Part 1:2004	Electricity Metering — Data Exchange For Meter Reading, Tariff And Load control — Glossary Of Terms Part 1 Terms Related To Data Exchange With metering Equipment Using DLMS/ COSEM
2.17	IEC 62056-1-0:2014	Smart metering standardisation framework
2.18	IEC 62056-3-1:2013	Use of local area networks on twisted pair with carrier signalling
2.19	IEC 62056-4-7:2014	DLMS/COSEM transport layer for IP networks
2.20	IEC 62056-5-3:2017	DLMS/COSEM application layer
2.21	IEC 62056-6-1:2017	Object Identification System (OBIS)
2.22	IEC 62056-6-2:2017	COSEM interface classes
2.23	IEC 62056-6-9:2016	Mapping between the Common Information Model message profiles (IEC 61968-9) and DLMS/COSEM (IEC 62056) data models and protocols
2.24	IEC 62056-7-3:2017	Wired and wireless M-Bus communication profiles for local and neighbourhood networks
2.25	IEC 62056-7-5:2016	Local data transmission profiles for Local Networks (LN)
2.26	IEC 62056-7-6:2013	The 3-layer, connection-oriented HDLC based communication profile
2.27	IEC TS 62056-8-20:2016	Mesh communication profile for neighbourhood networks
2.28	IEC TS 62056-9-1:2016	Communication profile using web-services to access a DLMS/COSEM server via a COSEM Access Service (CAS)
2.29	IEC 62056-9-7:2013	Communication profile for TCP-UDP/IP networks
2.30	IEC 62056-21:2002	Direct local data exchange
2.31	DLMS- White Book	Glossary of DLMS/COSEM terms
2.32	DLMS- Blue Book	COSEM meter object model and the object identification system
2.33	DLMS- Green Book	Architecture and protocols to transport the model

2.34	DLMS- Yellow Book	Conformance testing process
2.35	IEEE 802.15.4	Standard for Local and metropolitan area networks.
2.36	IEEE 802.15.4u	Standard for Local and metropolitan area networks (Use of the 865 MHz to 867 MHz Band in India)
Order of precedence between different standards shall be as follow:		
i	Indian Standards Issued By BIS	
ii	IEC standard	
Iii	Other standards like CBIP, DLMS etc.	

3. Service Conditions

SN	Item	Description
3.1	Temperature Range	Operation range: -10 Deg C to 55 Deg C Limit range of operation: -25 to 60 Deg C Limit range of storage / transport : -25 to 70 Deg C
3.2	Relative Humidity	0 to 96 %

4. Distribution System Data

SN	Item	Description
4.1	Supply	1 Phase AC, 2 wire
4.2	Voltage	240 V ± 6%
4.3	Frequency	50 Hz ± 5%
4.4	System Neutral	Solidly Earthed

5. Electrical and Accuracy Requirement

SN	Item	Description
5.1	Meter Type	Meter Type 1: 1- ø, 2 wire Static Watt-hour Smart Meter Meter Type 2: 1- ø, 2 wires Static Watt-hour Smart Meter fitted in polycarbonate box. Meter Type 1/ Type 2 shall be offered as per purchaser's requisition/ BOQ.
5.2	Connection	Direct / whole current
5.3	Rated Voltage	240V (phase to neutral) with variation of +30% & -40%. However meter should withstand the maximum system voltage.
5.4	Rated Current	Ib -10A and Imax- 60 A
5.5	Starting current	0.2 % of base current

5.6	Rated Frequency	50Hz +/- 5%
5.7	Accuracy Class	1.0 for Kwh, kVARH and kVAH (IS13779 applies for accuracy requirements)
5.8	Power Consumption	As per IS 16444 (Part 1) Meter with lowest power consumption shall be preferred.
5.9	Meter constant	Imp/ unit (Bidder to specify meter constant)
5.10	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.11	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.12	Influence of supply voltage	As per clause 4.4.2 of IS 15884
5.13	Short time over current	As per clause no. 4.4.3 of IS 15884
5.14	Immunity to phase and earth fault	As per clause no. 9.6 of IS 13779
5.15	Influence of Self Heating	As per IS 4.4.4 of IS 15884
5.16	Influence of Heating	As per IS 4.4.5 of IS 15884
5.17	Electromagnetic compatibility	a. Meter along with (NIC) shall remain immune to electrostatic discharge (upto and including 35KV), electromagnetic HF field and fast transient burst along-with NIC. b. The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not influence the meter. c. Meter shall be type tested for electromagnetic compatibility. d. Meter shall comply requirement of clause no. 4.5 and 5.5 of IS 15884.

5.18	Limits of error due to influence quantities	Meter shall work within guaranteed accuracy as per IS 13779/ IEC62053-21/ CBIP325 (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: BRPL reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.

6. Construction Feature

SN	Item	Description
6.1	General	Construction of meters shall confirm to the IS 16444 (Part 1)
6.2	Base Body	Material - Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level.
6.3	Top Cover	a. Material – Transparent/Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level. b. Top cover and base should be

		Ultrasonically/Chemically welded. c. Mechanism shall be provided to log event in case of top cover is opened. Bidder shall explain its mechanism.
6.4	Terminal Block	a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent. b. Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135 Deg C and pressure of 1.8MPa. The terminals shall be designed so as to ensure adequate and durable contact such that there is no risk of loosening or undue heating.
6.5	Terminal cover	a. Meter Type 1: The terminal cover shall be extended type with 2 no's holes of minimum 30 mm in diameter for cable entry. Meter Type 2: Short terminal cover with U cut suitable for entry of 2CX25 Sqmm Cable. b. Material - UV stabilized transparent/Opaque polycarbonate cover. c. Provision of sealing through sealing screws. d. The sealing screws shall be held captive in the terminal cover. e. Terminal cover should have provision for cable entry from bottom. f. Baffle wall shall be provided above the cable entry base wall so that access to the terminals is not possible (even with thin metallic wire) without breaking the seal. g. Diagram of external connections should be embossed on terminal cover. Sticker is not acceptable. h. Mechanism shall be provided to record an event with occurrence and restoration in case of terminal cover is opened. Bidder shall explain its mechanism.
6.6	Terminals	a. Terminals shall be suitable upto 25 Sqmm aluminium stranded cable. b. Two no's flat head screws and washers per terminal shall be provided c. Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % Imax. d. Terminals shall be clearly marked for phase / neutral / outgoing etc.

		e. Clearances and creep age shall be as per IS 13779.
6.7	Ingress Protection	IP 55 or better, but without suction in the meter.
6.8	Test Output device	Meter should 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.
6.9	RTC	a. The meter shall have internal real time crystal clock to set date and time. b. Drift in time of this clock shall not be more than ±5minutes/ year at a reference temperature of 27°C. c. Meter should have capability of Time synchronization. d. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. e. HES will sync RTC at least once a day.
6.9.1	Time keeping	As per IS 15884
6.10	Battery	Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Lithium thioyl Chloride battery will be preferred. In case battery removal or total discharge same should not affect the working & memory of the meter even in case of single wire power condition.
6.11	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power.
6.12	Self Diagnostic feature	Meter shall have self diagnostic for the following a. Date and RTC. b. Battery. c. Non volatile memory. d. Display e. Communication card status
6.13	Load Control Switch	a. Smart meter shall be equipped with integrated load control switches to control flow of electricity to the load at the instance of connect/ disconnect commands as per functional need of the system. b. Load switch for connect/ disconnect purpose shall be mounted inside the meter with suitable arrangement. c. Load Switches shall be provided in both phase and neutral d. The rating of switches used shall be in line with

		meter rating.
6.13.1	Performance requirement for load switching	a. Utilization category of the load switch shall be UC2 as per clause no. 4.6.6.2 of IS 15884. b. All load switches shall operate simultaneously.
6.14	Optical port	Meter shall have an optical port with a rust resistance coated metal ring to hold magnet of downloading probe. Optical port shall comply with hardware specifications provided in IEC-62056-21.
6.15	Communication Module Interface	a. Meter should have the provision for 01 no's plug in communication module for connectivity. The same interface shall be compatible with both Cellular and RF communication technologies interchangeable in field. b. Interface shall support data transfer between meter and network interface card over UART/ RS232. Bidder shall explain its pin out and standard in detail. c. Meter shall have mechanism to log communication module removal as an event in its memory with date and time stamp. d. Meter Vendor shall work with BRPL designated RF provider to integrate their module in the meter as per integration requirement mentioned in annexure 'C'. e. Preferred location of communication card module shall be on top of meter.
6.15.1	Communication modules (NIC)	a. Smart meter shall have 01 no's plug-in type communication modules/ Network Interface card (NIC) for connectivity of meter to HES from following options as per tender requirement: i. Communication Module/ NIC Type 1: RF based suitable for communication Network of BRPL designated RF canopy provider. ii. Communication Module/ NIC Type 2: RF and cellular communication module (LTE 4G with 3G and 2G fall back as per Indian Telecom Standards). b. Meter shall have separate indications on display/ for remote and local communication. c. Communication module shall held in a casing which can be directly plugged in the meter. Sealing screw shall be provided.

6.16	Last Gasp	Meter shall have provisions to provide last gasp signals through communication module in case of power failure. Bidder should explain in detail the provisions provided in meter to achieve the requirement.
6.17	Meter Sealing Arrangement	a. Sealing should be in accordance with IS and CEA metering regulations with latest amendments. b. Sealing arrangement shall be such that sealed parts shall not be opened without breaking the seal or sealed part itself. There should be clear evidence of the breaking in case sealed parts shall be opened without breaking the seal. c. Approval shall be taken from purchaser for location of seals and number of seals.
6.17.1	Manufacturer's Seals	a. One Polycarbonate seal to be provided on meter cover. b. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram).
6.17.2	BRPL Seals	a. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram). Meter sides should not have sharp edges to avoid damage to hologram seals. b. Minimum one Polycarbonate seal should be provided on top cover. c. Minimum 01 no's polycarbonate seals shall be provided for communication module. d. Seals will be issued to manufacturer free of cost.
6.17.3	Seal record	Record of all seals shall be forwarded to purchaser with each lot.
6.18	Name Plate and marking	a. Meter should have clearly visible, indelible and distinctly marked name plate in accordance with IS 16444 (Part 1) & clause no. 9.0 of this specification. b. All markings and details shall be printed by laser only. c. Paper stickers are not allowed for name plate.
6.19	Resistance against heat and fire	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.

6.20	Meter Box	As per Annexure 'E' if required in purchaser's requisition. Meter shall be factory fitted in meter enclosure by unidirectional screws.
6.21	Guarantee	a. 7.5 years from the date of dispatch or 7 year from date of commissioning, whichever is earlier b. Manufacturer shall undertake a guarantee to replace meter up to a period of 7 Year from the date of supply. The meters which are found defective/inoperative within the guarantee period shall be replaced as per meter service level agreement.

7. Functional Requirement

SN	Item	Description
7.1	Meter category	Smart meter comply with D1 category of IS 15959 (Part 2).
7.2	Mode of metering	It should be possible to configure meters in following modes of metering: a. Forwarded Only: In this mode any export active energy shall be treated as import energy and shall be recorded in forward only register. Apparent energy calculation shall be as per KVAH calculation mentioned in clause '7.4' b. Bidirectional: Both Import and export energy recording shall be applicable in this mode of metering and relevant registers shall be updated. Any change in metering mode shall be logged in events with date and time stamp. Default mode of metering shall be forwarded only until specified otherwise.
7.3	Payment Mode	It should be possible to configure meter in following modes of payment: a. Post payment mode b. Prepayment Mode Any change in payment mode shall be logged in events with date and time stamp. Prepayment facility shall be achieved by server / HES. Default mode of metering shall be post payment until specified otherwise.

7.4	KVAH Calculation	Lag only: KVAh is computed based on KVArh and KWH value. If PF=1, or leading, then KVAh = KWH. At no instance KVAh < KWh.
7.5	MD calculation	Block window with default demand integration period of 1800 s configurable to 900 s as per requirement. Extended register shall be used for MD recording.
7.6	TOU Metering	a. Meter shall be capable of doing TOD metering in minimum 4 tariff rate registers programmable for minimum 8 time zones and 4 seasonal profiles. b. TOU metering shall be implemented by the activity calendar method of IS 15959 Part 1 clause 9/ DLMS UA-1000-1/ IEC c. Special Day table shall be defined as per DLMS UA-1000-1/ IEC d. Default TOU programming shall be as per latest DERC guidelines. Prior approval shall also be taken from BRPL for the same. e. Tariff rate registers shall be as follow R1: Rate register for Peak R2: Rate register for Normal R3: Rate Register for Off Peak
7.7	Instantaneous Parameters	All the parameters mentioned in table 'A1' of IS 15959 (Part 2) along with following additional parameters shall be supported by meter: a. RF/ GSM signal Strength in milli db. b. Displacement PF. c. GPS coordinates. d. Temperature in Deg C. e. kVARH f. kVAH
7.7.1	Association rights	As per clause 11.1.1 of IS 15959 (Part 2).
7.8	Billing data	a. Billing parameters shall be generated at the end of each billing cycle and stored in memory as per provisions provided in clause no. 14 of IS 15959 (Part 2). b. 6 no's billing cycle parameters shall be remain in meter memory along with current cycle parameters and shall be available for reading as well as profile and or 'by entry' for selective access. c. All the parameters mentioned in table 'A4' of IS

		15959 (Part 2) shall be supported by meter.
7.8.1	Association Rights	As per clause 14 of IS 15959 (Part 2).
7.8.2	Selective access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.8.3	Billing period reset/ MD reset	00:00 Hrs of Ist of every month
7.8.4	Billing period reset mechanism	As per clause 10 of IS 15959 (Part 1)
7.8.5	Billing period counter	Cumulative billing period counter since installation and available billing periods shall be provided as per clause 11.2 of IS 15959 (Part 1).
7.9	Load survey Parameters	a. Load survey parameters shall be measured and recorded at the end of each profile capture period for last 35 Power ON days. b. All the parameters mentioned in table 'A15' of IS 15959 (Part 2) shall be supported by meter.
7.9.1	Association Rights	As per clause no. of IS 15959 (Part 2)
7.9.2	Selective Access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.9.3	Profile capture period	Default 1800 s programmable to 900 s.
7.10	Daily load profile	Daily load profile parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 35 Power ON days. All the parameters mentioned in table 'A16' of IS 15959 (Part 2) shall be supported by meter as Daily load profile parameters:
7.11	General Purpose Parameters	Following parameters shall be provided in Non Volatile memory (NVM) of the meter as per clause 16 of IS 15959 (Part 2).
7.11.1	Name Plate Detail	As per Table 'A26' of IS 15959 (Part 2) with following additional parameters. a. Month of manufacturing.
7.11.1.1	Association rights	As per clause 22.1 of IS 15959 (Part 2).
7.11.2	Programmable parameters	a. These 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. b. Programming of any of the parameters shall increment the 'Cumulative programmable count'

		value. c. All the parameters mentioned in table Table 'A27' of IS 15959 (Part 2) shall be supported by meters.
7.11.2.1	Association rights	As per clause 22.2 of IS 15959 (part 2)
7.11.3	Push Services	a. Smart meter is able to automatically notify data, event, and messages to a destination client system in an unsolicited manner (without a request from a client) as per clause no 6 of IS 15959 (Part 2). b. Randomization: Data from different endpoints shall be pushed intelligently on the network in order to avoid excessive traffic on the network for example in case all the endpoints will push load survey data simultaneously, then it may result in network choking or inefficient performance. Therefore with the help of intelligent techniques such field scenarios shall be handled effectively. c. It shall also be possible to configure push services for all profiles i.e instantaneous, billing, load survey, daily energy and events. Bidder should explain its capability to configure push services. However following push services shall be available by default. i. Load survey profile data at after every 4 hours configurable to any predefined interval. ii. Mid night data at 00:00 hrs of every day. iii. Billing profile data on occurrence of billing.
7.11.3.1	Periodic push (Smart meter to HES)	a. Meter shall be able to push instantaneous parameters to HES at predefined intervals. Parameters required for push shall be intimated during detailed engineering in the vent of order. 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.

7.11.3.2	Event Push (Smart meter to HES)	a. Meter is able to report HES, the status change of any of the identified events mapped in to event status word (ESW) of size 128 bits by pushing following objects to HES. i. Device ID ii. Push Setup ID iii. Real time clock- Date and Time iv. Event Status Word 1 (ESW 1). b. Each of the bits in ESW shall reflect the current state of the event and are mapped against each of the identified events. c. An event status word filter (ESWF) of 128 bit shall also be provided to configure events for event push. Events which are supported in meter shall only be configured for event push. Bit value 1 in ESWF shall indicate that the event is supported and value 0 indicates that event is not supported for event push. Position of the event bit in ESWF shall be same as in ESW.
7.11.3.3	Event status Bit mapping	As Per IS 15959 (Part 2)
7.12	Firmware upgrade	a. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. b. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3. c. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. d. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade. e. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory. f. Meter shall support capability to self register the meter with new firmware. g. The execution time of the change of the firmware within the meter should be below 1 minute

7.13	Support for broadcast message	Meter shall support connection less messaging services of DLMS to support broadcast messages for a group of meters for following actions: a. Gap reconciliations. b. Firmware upgrade. c. On demand readings. d. Meter connection and disconnection. e. Updating of Programmable parameters.
7.14	Disconnection mechanism	a. The Smart meter shall support disconnection (all the switches shall operate simultaneous) on the following conditions as per clause 11 of IS 16444 (Part 1): i. Over current (105 % of Imax in any element for predefined persistence time.) ii. Load control limit (Programmable) iii. Pre-programmed tamper conditions (Factory programmed) iv. Disconnection signal from Head end system. v. Pre paid function for prepayment mode. b. Meter shall use the disconnection control object as defined in clause 10 of IS 15959 (Part 2). c. Load limit function shall be disabled by default until other specified.
7.15	Local reconnection Mechanism	a. Meter shall be able to reconnect load switches locally only for Overload and load control limit disconnections. b. The meter will try to reconnect the load up to predefined time, with predefined interval (Time and interval is programmable). c. If the consumption is still more than the programmed limits, it will lock out and wait for 30 minutes. d. If the consumption is still above the limit, the procedure defined above in 1 and 2 shall be repeated. e. It shall be possible to remotely connect/disconnect the relay via commands from HES. The remote reconnect shall not interrupt the normal connect/disconnect cycle. f. In case of relay malfunction i.e.,

		connect/disconnect action of relay is not taking place due to welding of contacts or any other reason, then it shall be logged as an event in the Non-rollover compartment. Same shall be sent as an alert to HES. g. Remote command shall have priority over local communication.
7.16	Reconnection mechanism	a. Reconnection shall be done from HES except for over current and load control limit. In case of failure of communication / HES, reconnection shall be possible through Hand Held Device (CMRI) locally via proper security. b. Reconnection in case of prepayment meter shall be as per prepayment profile.
7.17	Status of load switch	a. Indication of status of relay i.e. connected/ disconnected should be available on display as well as through communication to HES. b. Connection and disconnection should be logged as events.
7.18	First breath and last gasp	a. Status indication of switch i.e. connected/ disconnected should be available on display as well as through communication to HES. b. In Last Gasp endpoint shall send the power outage notification with Time Stamp. In case of power failure meter communication module shall not draw power from the backup battery. c. For the purpose of sending the Last Gasp, meter shall have proper power backup (like a super capacitor).
7.19	Security	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided.
7.19.1	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
7.19.2	Encryption/ Authentication for data transport	As per clause 7.2 of IS 15959 (Part 2)
7.19.3	Key requirement and handling	As per clause 7.3 of IS 15959 (Part 2)

7.19.4	NIC security	a. Proper security at end points as well as network level shall be present to prevent unauthorized hacking of the end points or the network itself. b. The meter password is required to open a session between NIC and meter and is required to gain clearance from the meter to perform requested operation. c. If clearance not gains, the meter locks out communication for 1 minute. The meter maintain counter for monitoring of unsuccessful attempts of performing meter operations and alerts to HES. The counter is incremented each time a password clearance operation fails. d. Up to 3 no's successful attempts are allowed, after which the port is locked out until authenticated from system administrator.
7.20	IP communication profile support	Meter shall support TCP-UDP/ IP communication profile for smart meter to HES. Please refer clause 8 of IS 15959.
7.21	Connection/ Tamper Conditions	The meter shall continue to record forward energy under any one or combinations of the following conditions: a. I/C & O/G Interchanged b. Phase & Neutral Interchanged c. I/C Neutral Disconnected, O/G Neutral & Load Connected To Earth. d. I/C Neutral Disconnected, O/G Neutral Connected To Earth Through Resistor & Load Connected To Earth. e. I/C Neutral connected, O/G Neutral Connected to Earth through Resistor & Load Connected to Earth. f. I/C (Phase & Neutral) Interchanged, Load Connected To Earth. g. I/C & O/G (Phase or Neutral) Disconnected, Load Connected To Earth. During bidirectional mode for condition mentioned at sl no. 'a' meter shall record in export registers
7.22	Event and tamper detection	Meter shall detect and log any exceptional/ fraud/ tamper conditions in its memory as an event. In addition to this all transactions and control shall also be recorded as an event in meter memory. Each event type shall be

		identified by an event ID.
7.22.1	Association Rights	Each event shall be available to download as per following association rights. i. Public Client: No access ii. Meter Reader: Read only iii. utility Settings: Read only iv. Push Services: Read Only for identified events as per ESWF
7.22.2	Compartments of events	Meter shall be able to log events in following compartments a. Voltage Related Events b. Current Related Events c. Power Related Events d. Others Events e. Non Roll Over Events f. Transaction related events g. Control Events
		Occurrence and Restoration of Voltage Related, current related, power related and other events shall be logged in meter memory as per IS 15959 (Part 2). Please refer annexure 'A' for description of events, Event ID, Logics of events and threshold values of events.
		Threshold values shall be factory programmable.
		Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1).
		For each of the events a certain list of parameters shall be captured as per clause 'a'
		For each occurrence event captured, the cumulative tamper count shall be incremented.
		Only Real clock (date and time) and event code shall be captured events in compartments mentioned at sl no. 'd', 'f', 'g', 'h'.
7.22.3	Parameter Snapshot	Captured parameters mentioned above are to be captured when event occurrence and restoration is logged as per IS 15959 (Part 2). a. Date and time of event b. Event code c. Active Current d. Voltage e. Power factor

		f. Cumulative energy- kWh, kVAh, kVARh
		Captured parameters are to be captured at the time of logging of event occurrence and restoration
7.22.4	Event Logging	The meter shall log minimum 100 tamper events (ensuring at least 20 events for each tamper).
7.22.5	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.

8. Meter Display

SN	Item	Description		
8.1	LCD Type	STN Liquid crystal with backlit		
8.2	Viewing angle	Minimum 160 Degree.		
		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.		
8.3	Size of LCD	Minimum 10 mm X 6 mm		
8.4	LCD Digits	Total 6 +1 digits		
8.5	LCD language	English		
8.6	Display mode	Following parameters should be displayed in Auto scroll with programmable interval		
		Order	Parameter	Display time
		1	LCD Test	5 Sec
		2	Meter Sr. No.(8 digits)	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	Power Factor	5 Sec
		10	Frequency	5 Sec
		11	Instantaneous Load KW	5 Sec
		12	Signal Strength (RF/ GSM)	5 Sec

		13	Temperature	5 Sec
		14	kVARh	5 Sec
		15	kVAH	5 Sec
		Meter with push button for manual display shall not be acceptable.		
8.7	Display indications	Appropriate indications/flags for all tampers and self diagnostic features should be provided.		

9. Data and Communication Protocol/ HES/ Integrations/ Software

SN	Item	Description
9.1	Data Exchange protocol	a. Meter should comply Indian companion of data exchange and tariff control specification IS 15959 (Part 2). b. In case of additional requirement from IS 15959 (part 2), they shall be as per DLMS standards/ IEC DLMS protocols suite (62056). c. Bidder shall explain in detail the additional parameters/ services/ methods used in meters from IS 15959 (part 2) and its reference to DLMS books/ IEC. d. Prior to manufacturing of meters bidder shall provide a detailed specification explaining all parameters/ services/ methods used in meter in addition to IS 15959 (Part 2).
9.2	Integration with HES	a. Bidder shall work with BRPL IT team/ BRPL designated system integrator to integrate its meter with BRPL HES system as per integration requirements mentioned in annexure 'C'. b. Bidder shall prepare detailed documents as mentioned in above clause and submit it for BRPL approval and integration with HES.
9.3	Base computer software	Licensed Software with the following features should be supplied for free to download meter through optical port.
9.3.1	Operating System	BCS should be compatible for latest Windows operating system.
9.3.2	Security	System shall be password protected where user can login only if login ID is provided by administrator. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
9.3.3	Database	BCS shall maintain master database according to desired area, location, and region etc.
9.3.4	Reporting	a. BCS shall have option of user defined report generation in format of Excel, Word and CSV, XML, PDF etc. b. BCS shall have capability to export data in ASCII, CSV

		and XML format at desired location so that the same could be integrated with our billing data for processing. c. All the data available in the meter shall be convertible to user defined ASCII, CSV and XML file format.
9.3.5	Data transfer rate	BCS and communication ports should support data transfer rate of 9600 bps (minimum).
9.4	Hand Held Unit Software	a. The manufacturer has to provide software capable of downloading all the data stored in meter memory through window/ android operating system based handheld units (HHU) through optical port. b. In the event of order, bidder shall work with BRPL IT team/ BRPL designated system integrator to develop HHU software for meter downloading and further uploading on HES. c. HHU software should have option for selection of parameters to be downloaded from meter. d. Meter data consisting of all parameters and complete load survey for all parameters shall be read by HHU and downloaded on HES in minimum possible time (not more than 5 minutes).
9.5	Training	Manufacture shall impart training to BRPL personnel for usage of software and installation.

10. Name Plate

SN	Description
10.1	Meter Serial number shall be of 8 digits. Serial number shall be printed in black colour. Embossing is not acceptable.
10.2	Size of the digit shall be minimum 5X3mm
10.3	Bar code shall be printed along with serial number
10.4	BIS registration mark (ISI mark)
10.5	'BRPL' insignia shall be printed above LCD display.
10.6	BRPL PO No. & date
10.7	Manufacturers name and country of origin
10.8	Model type / number of meter
10.9	Year of manufacturing
10.10	Reference voltage / current rating
10.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
10.12	Meter constant
10.13	Class index of meter

10.14	Reference frequency
10.15	Warranty period
10.16	Symbol of load switch
10.17	Name plate of NIC a. Serial no of NIC along/ IMEI no/MAC address with bar code b. Name of purchaser's c. Communication technology with carrier frequency d. Manufacturing year and month. e. Warranty period.

11. Component Specification

SN	Item	Description	Make
11.1	Current Transformers	The Meters should be with the current transformers as measuring elements.	The current transformer should withstand for the clauses under 4.18(t)
11.2	Shunt element	Data sheet should be submitted.	Reputed
11.3	Measurement or 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, Atmel, Phillips, SAMES ,NEC,TEXAS
11.4	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Hitachi, Compiled
11.5	Display modules	a) The display modules should be well protected from the external UV radiations. b) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). c) It should be STN type industrial grade with extended temperature range min 70 ºC.	Truly semiconductor, Tianma / Haijing Electronics, China, Hitachi,
11.6	Optical port	The mechanical construction of the port should facilitate the data transfer. Communication shall not disturbed by external light.	Everlight, Osram, Agillent, NFC

11.7	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 in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	
11.8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.	National Semiconductors, Atmel, Phillips, Texas Instruments. Hitachi, Compiled, AVX or Ricoh Samsung, EPCOS, Vishay
		LED	Everlight, Agillent
11.9	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
11.10	Battery	Lithium with guaranteed life of 15 years	Texcell, SAFT, Varta
11.11	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas Atmel, Motorola, Microchip, TEXAS, NEC or Compiled
11.12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)
11.13	Load Switch	Utilization Category UC2/ UC3 Latching relay Can withstand 120% of Vref and 120% of Imax current. As per IS 15884	Gruner/ KG/ any other reputed make subject to BRPL approval.
11.14	Note	a. The components used by manufacturer shall have	

		"Minimum Life" more than the 10 years. b. Incase vendor want to use other make components; same shall be approved by BRPL before use. c. Even for existing supplier – fresh approval is needed for all deviations. d. Manufacturer should have complete tracking of material used in meter. BRPL reserve the right to carry out audit of inventory/ manufacturing process at manufacturer's works and sub vendor's work.	

12. Quality Assurance, Inspection and Testing

SN	Item	Description
12.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
12.2	Sampling Method	Sampling Method for quality checks shall be as per relevant IS/ IEC/ CBIP guidelines and Purchaser's prior approval shall be taken for the same.
12.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.
12.4	Type Tests	a. The meter shall be of type tested quality including all tests specified in this specification which are beyond IS / IEC or CBIP. b. Type test conducted from CPRI/ ERDA/ or any other lab specified by BIS/ CEA for smart meter testing will be treated as valid. c. Type test certificate should be submitted along with offer for scrutiny. d. Any other component supplied in addition to meter shall also be type tested as per IS /IEC if applicable. e. Complete type test as per IS 16444 (Part 1) shall be carried out on sample selected from BRPL lot.
12.5	Routine tests	All test marked "R" as per table 20 of IS 13779.
12.6	Acceptance Tests	a. All tests marked "A" as per table 20 of IS 13779. b. Smart meter functional tests as per IS 16444 Table 1

		c. Test of load switch as per clause 10.4 of IS 16444 (Part 1) d. Test for data exchange protocol as per clause 10.5 of IS 16444. e. Test for Smart meter communicability as per clause no. 10.6 of IS 16444 (Part 1). f. All the routine and acceptance tests shall be carried out as per relevant standards. g. Following tests in addition to IS shall be conducted during lot inspection. I) Dimensional and drawing verification. II) Display parameters/ sequence. III) Data Downloading from CMRI and PC. IV) Tamper/ fraud detection/logging features as per approved Documents. Tamper conditions will be simulated at varying load up to Imax. Accuracy will also be checked during tamper simulation. V) Burn in chamber test. VI) Component verifications. h. Purchaser reserves the right to formulate any other test method to verify guaranteed parameters of Meter.
12.7	ESD and Magnetic Interference test	ESD and magnetic interference test will be conducted at Samir lab, Chennai or CPRI.
12.8	Inspection	a. Purchaser reserves the right to inspect /witness all tests on the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards. b. Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per relevant standards/ this specification and tampers logics as per approved GTP. All the equipments including tamper logs kits/ jigs should be calibrated. c. In-process and / or final inspection call intimation shall be given in advance to purchaser.

13. Packing, Marking, Shipping, Handling and Storage

SN	Item	Description

13.1	Packing	a. Each meter must be packed, together with its terminal cover, in a separate environmental friendly cardboard box, which can be opened and re-closed without needing adhesives. b. Up to 10 single-phase meters in case of meter type 1 and 5 no's meters with enclosure in case of meter type 2 must be packed together with their terminal covers in a group cardboard box, which can be opened and re-closed without needing adhesives. c. The box shall prevent, as much as possible, penetration of dust during long storage periods. The box must be designed for multiple use and be robust, with wall thickness of at least 4 mm. d. Maximum weight of a group meter box shall not be more than 25 Kg. e. The packaging will protect the meters against shock and vibration, preventing damage due to the road conditions during transport and distribution in the field. The electrical and mechanical properties shall not be affected by these disturbances. f. For shipping the boxed meters will be close packed by stockpiles of suitable quantities on pallets. The meters numbers sequence (without partition) shall be kept in each pallet. A pallet will be protected against moisture by a polyethylene hood, covered with a cardboard cover (hood), and fixed onto the pallet by parallel polypropylene bands, using protection angle bars at the corners. The hood shall be marked – on the front (wide side), on the narrow side and on the top as per clause 13.3. g. Each pallet should contain between 70 and 300 meters. The actual number of meters on each pallet will be agreed with the BRPL in the event of order. h. An impact detector ("Shock-Watch") label shall be attached to the cardboard hood of several pallets in each container/ transport truck, to warn of possible rough handling during shipment, transport and storage.
13.2	Packing for accessories and spares	Robust non returnable packing case with all the above protection & identification Label.
13.3	Marking	On each group box and pallet, following details are required

		both on front (wide side) and top: a. BRPL logo. b. Meter serial number range along with bar code. c. Unique number of box/ pallet. d. Purchaser's name e. PO number (along with SAP item code, if any) & date with bar code f. Equipment Tag no. (if any) g. Destination h. Manufacturer / Supplier's name i. Address of Manufacturer / Supplier / it's agent j. Type , rating and other description of equipment k. Country of origin l. Month & year of Manufacturing m. Case measurements n. Gross and net weights in kilograms o. All necessary slinging and stacking instructions
13.4	Test reports	Routine test report to be provided with each meter
13.5	Shipping	The seller shall be responsible for all transit damage due to improper packing.
13.6	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet /manual to be furnished before commencement of supply.

14. Deviations

14.1	Deviations	a. Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. b. In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.

15. Drawing Submission

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

SL	Detail of Document	Bid	Approval	Pre

				Dispatch
1	Guaranteed Technical particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Tamper Sheet	Required	Required	
4	Display Parameters	Required	Required	
5	GA / cross sectional drawing of Meter showing all the views / sections	Required	Required	
6	Detail of network interface i.e. pin out, standard, voltage level etc and its integration requirement.	Required	Required	
7	Samples of each type and rating offered along with box and RF NIC/ communication module of already integrated RF card as per tender qualifying criteria.	4 no's (2 no's without box and 2 no with box)	2 no's (1 no's without box and 1 no with box)	
8	Any software and accessories required for installation/ operation of meter	Required	Required	
9	Manufacturer's quality assurance plan and certification for quality standards	Required		
10	Type Test reports of offered model/ type/ rating	Required		
11	BIS certificate	Required		
12	Complete product catalogue and user manual.	Required		
13	Customer Reference List	Required		
14	Recommended list of spare and accessories	Required		
15	Specification documents containing all parameters, Services, Methods in addition to companion specification of IS 15959 (part 2).		Required	
16	Program for production and testing (A)		Required	Required
17	Makes of components		Required	Required
18	Detailed installation and commissioning instructions		Required	Required
19	As Built Drawing		Required	Required
20	Operation and maintenance Instruction as well as trouble shooting charts/ manuals		Required	Required
21	Inspection and test reports, carried out in manufacturer's works			Required
22	Routine Test certificates			Required
23	Test certificates of all bought out items			Required
24	Meter Seal data			Required

25	Mapping of meter serial no to Communication card.			Required

16. Delivery

16.1	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.

Annexure – A: Guaranteed Technical Particulars

Bidder shall furnish the GTP format with all details against each clause of this specification.
Bidder shall not change the format of GTP or clause description.
Bidder to submit duly filled GTP in hard copy format with company seal.

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

Bidder / Vendor seal / signature ----------

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number and email id	

Annexure – B: Recommended Accessories / Spares

SL	Description of spare part	Unit	Quantity
1		No	
2		No	

Annexure – C: Integration Requirement of Meters with NIC and HES

Integration requirements with communication provider of BRPL/ any other agency designated by BRPL for other components of AMI.

a. Bidder(s) must share the meter security keys, all level encryption, and password information along with asset information in a format with the buyer / communication provider of BRPL so that during AMI business flow, the device and data can be authenticated all the time.
b. Bidder(s) must share the details of meter communication specifically programmed protocols.
c. Bidder(s) must share the meter configuration source code to the BRPL/ communication provider of BRPL.
d. Bidder (s) must share the meter interface touch points for external applications/ systems.
e. Bidder(s) must share the required APIs including but not limited to reading APIs, configuration APIs and Functional APIs with the System Integrator for execution of business flow (Installation, reading, configuration).
f. Bidder(s) must share the data storage and retrieval details.
g. Bidder(s) must configure the devices to be upgraded remotely (OTA) and share the required firmware source code (with updates over the project life) with system integrator as and when it is required in case of feature request or fault correction.
h. Bidder(s) must follow and conduct Utility's sample and periodic test program, including (but not limited to) the selection of a sample population of meters, sharing of sample test results as reported by the meter testing systems with the system Integrator.
i. Bidder(s) must share the information related to communication module for the authorization purpose at to BRPL/ communication provider of BRPL.

Annexure – D: Tamper and Fraud Detection Events

1. Voltage Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Over Voltage (occurrence/ restoration)	Meter should log high voltage event if voltage in any phase is above a threshold value. Threshold value is factory programmable.	Occurrence: If Vpn>110% Vref Restoration: If Vpn<=110% Vref	Occurrence: 5 Min Restoration: 5 Min
Low Voltage (occurrence/ Restoration)	Meter should log low voltage event if voltage in any phase is below a threshold value. Threshold value is factory programmable.	Occurrence: If Vpn<75% Vref Restoration: If Vpn>=75% Vref	Occurrence: 5 Min Restoration: 5 Min
2. Current Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Reverse Power/ reverse current	Meter should log the event of power reverse if meter detect power flow from outgoing to incoming terminals.	Occurrence: If Ip = -ve direction Restoration: If Ip=+ve direction	Occurrence: 5 Min Restoration: 5 Min
Over current (occurrence/ restoration)	If the current in any phase exceeds the specified threshold current, meter should log over current event.	Occurrence: If Ip>Imax Restoration: If Ip<=Imax	Occurrence: 5 Min Restoration: 5 Min
Earth Loading (occurrence/ restoration)	Meter shall able to detect and log of earth loading condition if difference in phase and neutral current found less than a specified % of basic current rating of meter for a specified time threshold value. This event will be restored if this difference remain less than the specified threshold value for a specified restoration	Occurrence: If |Ip-In|>10% Ib Restoration: if |Ip-In|<=10% Ib	Occurrence: 5 Min Restoration: 5 Min
3. Power Related Events.			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Power OFF (occurrence/ restoration)	Meter shall detect power OFF if all phase voltages are absent. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded.	5 Min	5 Min

Abnormal Power Off (Occurrence/ restoration)	If meter micro detect power off whereas phase voltage is present than abnormal power will be recorded. Meter shall continue to record energy as per phase voltage and current.	Occurrence: If voltage at meter power supply<10% vref and Vpn>20% vref. Restoration:	NA
4. Other Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Abnormal External Magnetic Influence (Occurrence/ Restoration)	a. Meter should either be immune or should log the events of attempt of tampering by external magnetic field as per relevant IS13779/ CBIP 325 with latest amendments. b. If the working of meter gets affected under the influence of external magnetic field, meter should record energy at Imax. Meter should not compute MD during this period. The meter shall record energy as per actual load once the magnetic field is removed.	As per IS 13779/ CBIP 325	As per IS 13779/ CBIP 325
Neutral Disturbance- HF, DC and Alternating (occurrence/ restoration)	Meter should log the event when AC/DC/ Pulsating voltage is injected in neutral circuit.	Bidder shall define threshold values	Bidder shall define threshold values
Low Power Factor	Meter shall able to detect and log the low PF event if power factor of the load found between 0.2 to 0.5 for a load above than a % threshold value for a threshold time value. Event shall restore if PF factor of load remain out of range 0.2 to 0.5 for a load above than % threshold value	Occurrence: 0.2<PF<=0.5 and Iphase>10%Ib Restoration: (PF<0.2 or PF>0.5) and Iphase>10%Ib	Occurrence: 5 Min Restoration: 5 Min

Single Wire Operation (occurrence/ Restoration)	In case of single wire power is detected , event shall be logged.	If Ip or Ip >100 mA and Vpn<10% vref.	Occurrence: 5 Min Restoration: 5 Min
Plug in Communication module removal (Occurrence/ Restoration)	Meter should log the removal of communication card. Meter should also log insertion of communication card.	By NC switch/ sensor	
Configuration change to post-paid mode/ pre-paid mode	Meter should log the change in payment mode configuration.	NA	NA
Configuration change to "Forwarded" only" mode/ "Import and Export" mode	Meter should log the change in metering mode configuration.	NA	NA
Overload (Occurrence/ Restoration)	Meter should able to log the status of overload in KW	5 min	5 min
HV Spark (Occurrence/ restoration)/ Jammer	Meter with communication card should be immune or log the event in the case of application of ESD upto and including 35 KV.	Immediately	NA
5. **Non roll over Events:**			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Occurrence of cover open	When meter cover opened		Immediately (First occurrence shall always remain in meter memory)
6. **Detail of Transaction**			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Real Time Clock- Date and Time			
Demand Integration Period			
Profile Capture Period			

Single Action schedule for billing date		
Activity calendar for time zones		
New firmware activated		
Load Limit (Kw) Set		
Enable Load Limit Function		
Disable load limit function		
LLS secret (MR) change		
HLS key (US) change		
HLS key (FW) change		
Global key change		
ESWF change		
MD reset		
7. Control Events:		
Event Description		
Load Switch Status- Disconnected		
Load Switch Status- Connected		

Note:

1. Event ID's shall be defined as per BRPL specification/ IS 155959 (part 2). Approval shall be taken from BRPL prior to manufacturing for Event ID's
2. Programming of threshold values should be possible from remote via proper authentications.
3. Logics of tampers can be changed/ upgraded via firmware up gradation from remote via proper authentication.
4. All the programming changes/ firmware up gradations shall be logged along-with date and time stamp in meter as well as on HES.

Annexure – E: Meter Enclosure

SL	Clause	Clause Description
1.0	Meter Box Type	Flush type with Completely transparent top cover and base with Incoming and Outgoing cable entry and data downloading arrangement.
2.0	Design	Meter box shall comply following requirement.
2.1	General Requirement	The meter box shall be designed in such a way that no access to the meter body, terminals and hardwired port of the meter shall be possible after installation and sealing of the box without breaking the box itself.
2.2	Theft Protection	a. Meter box shall be theft proof i.e. meter box cannot be opened without breaking the seals or meter itself. b. On breaking of the box, clear evidence of the physical tempering shall be visual.
2.3	Parts of the box	a. The meter box shall be designed in 02 parts i.e. base and top cover. b. Meter shall be mounted inside the base on fixed moulded pillars by unidirectional screw. c. Meter top cover should be hinge type. d. Cable glands and earthing bolt shall be provided at the base as per construction requirement. e. Proper stiffeners shall be provided in the body of the base and top cover to provide mechanical strength against transportation and installation vibrations.
2.4	Ingress protection	The meter box shall be completely dust and vermin proof. Ingress protection rating of the box shall be minimum IP55.
2.5	Collar of base and cover	a. A 'U' shaped groove shall be provided in the collar of the base body, in which UV stabilized rubber 'O' shall be installed. The design of lining shall be such that it provides proper sealing between the cover & base of box to avoid penetration of dust and ingress of water. b. All around projection provided inside the cover periphery which keeps the ‘O’ ring pressed. c. An outside collar shall also be provided, which shall cover outer surface of the collar.
2.6	Fixing of 'O' ring	a. Rubber ‘O’ Ring should be fixed with suitable adhesive so that the same does not get removed. b. Rubber 'O' ring shall be fixed in a single piece without any gap between open ends. Open end of the 'O' ring shall be provided at the bottom side only.
3.0	Material	The material shall be as follow:

SL	Clause	Clause Description
3.1	Box material	a. The material of meter box shall be flame retardant with inflammability level V0 having good dielectric and mechanical strength. b. The top Cover and Base of the box shall be made out of transparent polycarbonate with minimum 90% visibility so as to ease installation and monitoring of box against any tampering. The material shall be 'UV' stabilized to ensure that the moulded meter box should not change in colour, shape, size or should not get brittle after exposure to UV rays.
3.2	Hardware	All the metal hardware including hinges, U latches, mounting screws, downloading port ring etc shall be of rust proof stainless steel.
3.3	Cable glands	Polyamide Nylon-66 with flammability class FV0
4.0	Construction	a. Meter box shall be constructed by moulding of polycarbonate material as specified in clause no. 3.1 b. Thickness of meter box shall be minimum 2.0 mm.
4.1	Moulding	The box shall be made through Injection moulding or better method.
4.2	Base	Meter shall be factory fitted inside base body using unidirectional screws, on fixed mounting pillars, moulded in to the base of sufficient strength, so that removing of meter shall not possible without breaking the meter box or meter itself.
4.3	Top cover	Hinge type
4.3.1	Hinge type	a. Minimum 02 no's concealed / internal hinges, not visible or accessible from outside the box without breaking the box itself. b. Minimum 02 no's U latches shall be provided to closed the box with sealing arrangement at each U latch. c. After closing the U latches no play/ gap shall exist between base and top cover.
5.0	Padlocking	The box shall also have padlocking facility.
6.0	Cable entry	a. 02 no's as incoming and outgoing at the 45 Deg Chamfer bottom corners suitable for 2CX25 Sqmm armoured aluminum cable. b. Cable entry must be at the bottom diagonal ends of the meter box. Appropriate clearance shall be provided between the cable entry and position of meter terminals for proper cable bending and connection. c. Minimum 60 mm vertical space shall be provided from the

SL	Clause	Clause Description
		terminals of meter to centre of cable gland to provide sufficient bending radius and working space.
6.1	Cable Gland	a. Two nos. of Elbow shaped glands made out of Polyamide Nylon-66 suitable for 2CX10 / 2CX25 sqmm aluminium armoured cable shall be provided on both cable entries in the box. b. Glands shall be designed in such a manner that the same cannot be unscrewed / removed from the box from outside. Manufacturer may either supply two nos. of check nuts or any other alternate design to meet this requirement.
7.0	Earthing bolt	a. Earthing bolt of M6 with nut and washer shall be provided on left side of the body of meter box. b. The arrangement shall be such that one earth point shall be available for customer and external earthing provided by BRPL can be terminated. c. Necessary symbol shall be provided for earth terminal.
8.0	Mounting	Mounting arrangement shall be as follow
8.1	Meter mounting pillars	a. Fixed type, moulded in to the base body as per the requirement of meter mounting holes. b. Stiffeners shall be provided at the base of the mater mounting pillars.
8.2	Meter box mounting	a. Four (4) nos. fixing holes of 6 to 6.5 mm diameter at the back surface of box shall be provided to fix the same on flat wall. b. Mounting holes shall not be obstructing by Incoming or Outgoing cables.
8.3	Box Mounting spacers	04 no's, 25 mm minimum mounting spacer moulded at the mounting holes of back surface of the meter box in order to provide space between meter back surface and wall.
8.4	Box Mounting accessories	Long pan head self taping SS screws and washers shall be provided by the supplier with every box. 4 no's plastic fixing plugs suitable for self tapping screws shall also be provided.

SL	Clause	Clause Description
9.0	Data Downloading arrangement	a. Option 1: i. Slot for optical head with non removable corrosion ferromagnetic metal ring. ii. Data downloading shall not be affected by scratches on data downloading port or with ageing of box. iii. Data downloading shall not be affected by visible light conditions. b. Option 2: i. DB9 RS232 connector shall be provided at the top cover of box to download meter as specified in clause no. 9.1 ii. Meter shall be downloadable without opening of the box/ breaking of seals. iii. This arrangement shall not de-rate the IP rating of meter box. iv. A Top hinges and bottom sealable cover shall be provided on the data downloading slot. v. Data downloading shall not be affected by visible light conditions.
9.1	Optical to RS232 cable (If option 2 as per clause no. 9.0	Optical reader with 9 pin D-type female connector cable shall be provided in each meter box. Push fit type protective cover with sealing arrangement for data downloading port on the cover of the meter box has to be provided. The optical meter reader with 9 pin D-type female connector cable of all the meter boxes (100%) shall be tested for meter downloading before dispatch.
10.0	Marking	Following marking shall be provided on both top cover and base by fine quality indelible laser printing/ screen printing or embossed from inside of the box. a. BRPL insignia shall be embossed on the base & cover of meter box. b. Meter serial no. (Both on base and cover of meter box) c. Purchaser's PO no. and date. d. Purchaser's Name. e. Name or trade mark of seller f. Any other detail required at the time of approval.

Technical Specification for Three Phase WC Smart Meter

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Prepared By	Reviewed by	Approved By
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Index

Record of Revision

Item/Clause No.	Change in Specification	Reason of change	Approved By	Rev

1. Scope of Supply

This specification covers the following for Three Phase 240 V, 20A-100A Static Watt hour smart meters of accuracy class 1.0 with plug in communication modules (RF mesh only and RF + Cellular technology) and integrated load control switches.

A. Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.
B. Any accessories / hardware required for installation and operation for the meter.

2. Codes and Standards

Materials, equipment and methods used in the manufacturing of above mentioned equipment shall conform to the latest edition/ of following

S No.	Standard Number	Title
2.1	Indian Electricity Act	IE Act 2003
2.2	CEA Metering Regulations	With latest amendments
2.3	CBIP Manual (Pub no.-325)	Standardization of AC Static Electrical Energy Meters
2.4	IS- 16444 (Part 1)	AC Static Transformer Operated Watt-hour Smart Meters, Class 1.0 and 2.0 Part 1 Specification
2.5	IS- 13779	AC Static Watt-hour Meters, Class 1 and 2 – Specification
2.6	IS-15959 (Part 1)	Data Exchange for Electricity Meter - Reading Tariff and Load Control - Companion Specification
2.7	IS-15959 (Part 2)	Data Exchange for Electricity Meter - Reading Tariff and Load Control (Part 2)- Companion Specification for smart meter
2.8	IS- 11448	Application guide for AC Electricity meters
2.9	IEC- 62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
2.10	IEC- 62053-21	Electricity metering equipment (A.C) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
2.11	IEC- 62053-52	Electricity metering equipment (AC) - Particular requirements - Part 52: Symbols
2.12	IEC 62053-61	Electricity metering equipment (A.C.) - Particular requirements - Part 61: Power consumption and voltage requirements
2.13	IEC 62058-11	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
2.14	IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)

2.15	IEC 60736	Testing Equipment for electrical Energy meter
2.16	IS/IEC/TR 62051:Part 1:2004	Electricity Metering — Data Exchange For Meter Reading, Tariff And Load control — Glossary Of Terms Part 1 Terms Related To Data Exchange With metering Equipment Using DLMS/ COSEM
2.17	IEC 62056-1-0:2014	Smart metering standardisation framework
2.18	IEC 62056-3-1:2013	Use of local area networks on twisted pair with carrier signalling
2.19	IEC 62056-4-7:2014	DLMS/COSEM transport layer for IP networks
2.20	IEC 62056-5-3:2017	DLMS/COSEM application layer
2.21	IEC 62056-6-1:2017	Object Identification System (OBIS)
2.22	IEC 62056-6-2:2017	COSEM interface classes
2.23	IEC 62056-6-9:2016	Mapping between the Common Information Model message profiles (IEC 61968-9) and DLMS/COSEM (IEC 62056) data models and protocols
2.24	IEC 62056-7-3:2017	Wired and wireless M-Bus communication profiles for local and neighbourhood networks
2.25	IEC 62056-7-5:2016	Local data transmission profiles for Local Networks (LN)
2.26	IEC 62056-7-6:2013	The 3-layer, connection-oriented HDLC based communication profile
2.27	IEC TS 62056-8-20:2016	Mesh communication profile for neighbourhood networks
2.28	IEC TS 62056-9-1:2016	Communication profile using web-services to access a DLMS/COSEM server via a COSEM Access Service (CAS)
2.29	IEC 62056-9-7:2013	Communication profile for TCP-UDP/IP networks
2.30	IEC 62056-21:2002	Direct local data exchange
2.31	DLMS- White Book	Glossary of DLMS/COSEM terms
2.32	DLMS- Blue Book	COSEM meter object model and the object identification system
2.33	DLMS- Green Book	Architecture and protocols to transport the model
2.34	DLMS- Yellow Book	Conformance testing process
2.35	IEEE 802.15.4	Standard for Local and metropolitan area networks.
2.36	IEEE 802.15.4u	Standard for Local and metropolitan area networks (Use of the 865 MHz to 867 MHz Band in India)
Order of precedence between different standards shall be as follow:		
i	Indian Standards Issued By BIS	
ii	IEC standard	
iii	Other standards like CBIP, DLMS etc.	

3. Service Conditions

SN	Item	Description
3.1	Temperature Range	Operation range: -10 Deg C to 55 Deg C Limit range of operation: -25 to 60 Deg C Limit range of storage / transport : -25 to 70 Deg C
3.2	Relative Humidity	0 to 96 %

4. Distribution System Data

SN	Item	Description
4.1	Supply	3 Phase AC, 4 wire
4.2	Voltage	415 V ± 6%
4.3	Frequency	50 Hz ± 5%
4.4	System Neutral	Solidly Earthed

5. Electrical and Accuracy Requirement

SN	Item	Description
5.1	Meter Type	Meter Type 1: 3- ø, 4 wire Static Watt-hour Smart Meter Meter Type 2: 3- ø, 4 wires Static Watt-hour Smart Meter fitted in polycarbonate box. Meter Type 1/ Type 2 shall be offered as per purchaser's requisition/ BOQ.
5.2	Connection	Direct / whole current
5.3	Rated Voltage	240V (phase to neutral) with variation of +30% & -40%. However meter should withstand the maximum system voltage.
5.4	Rated Current	Ib -20A and Imax- 100 A
5.5	Starting current	0.2 % of base current
5.6	Rated Frequency	50Hz +/- 5%
5.7	Accuracy Class	1.0 (IS13779 applies for accuracy requirements)
5.8	Power Consumption	As per IS 16444 (Part 1)
5.9	Meter constant	Imp/ unit (Bidder to specify meter constant)
5.10	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.11	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.12	Influence of supply	As per clause 5.5.2 of IS 15884

	voltage	
5.13	Short time over current	As per clause no. 5.5.3 of IS 15884
5.14	Immunity to phase and earth fault	As per clause no. 9.6 of IS 13779
5.15	Influence of Self Heating	As per IS 5.5.4 of IS 15884
5.16	Influence of Heating	As per IS 5.5.5 of IS 15884
5.17	Electromagnetic compatibility	a. Meter shall remain immune to electrostatic discharge (upto and including 35KV), electromagnetic HF field and fast transient burst. b. The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not influence the meter. c. Meter shall be type tested for electromagnetic compatibility. d. Meter shall comply requirement of clause no. 5.5 and 5.5 of IS 15884
5.18	Limits of error due to influence quantities	Meter shall work within guaranteed accuracy as per IS 13779/ IEC62053-21/ CBIP325 (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: BRPL reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.

6. Construction Feature

SN	Item	Description
6.1	General	Construction of meters shall confirm to the IS 16444 (Part 1)
6.2	Base Body	Material - Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level.
6.3	Top Cover	a. Material: Transparent/Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level. b. Top cover and base should be Ultrasonically/Chemically welded.
6.4	Terminal Block	a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent. b. Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135C and pressure of 1.8MPa. The terminals shall be designed so as to ensure adequate and durable contact such that there is no risk of loosening or undue heating.
6.5	Terminal cover	a. Material - UV stabilized transparent/Opaque polycarbonate cover b. Provision of sealing at two points through sealing screw. c. The sealing screws shall be held captive in the terminal cover. d. The terminal cover shall be extended type 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. Terminal cover should have provision for cable entry from bottom. e. Diagram of external connections should be embossed on terminal cover. Sticker is not acceptable. f. Mechanism shall be provided to record an event with occurrence and restoration in case of meter enclosure/ terminal cover is opened.

6.6	Terminals	a. Terminals shall be suitable upto 50 Sqmm aluminium cable. b. Two no's flat head screws per terminal shall be provided c. Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % Imax. d. Terminals shall be clearly marked for phase / neutral / outgoing etc. e. Clearances and creep age shall be as per IS 13779.
6.7	Ingress Protection	IP 55 or better, but without suction in the meter.
6.8	Output device	Meter should 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.
6.9	RTC	a. The meter shall have internal real time crystal clock to set date and time. b. Drift in time of this clock shall not be more than ±5minutes/ year at a reference temperature of 27°C. c. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. d. HES will sync RTC at least once a day.
6.9.1	Time keeping	As per IS 15884
6.10	Battery	Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Lithium thioyl Chloride battery will be preferred. In case battery removal or total discharge same should not affect the working & memory of the meter even in case of single wire power condition.
6.11	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power.
6.12	Self Diagnostic feature	Meter shall have self diagnostic for the following a. Date and RTC. b. Battery. c. Non volatile memory. d. Display e. Communication Card Status

6.13	Load Control Switch	a. Smart meter shall be equipped with integrated load control switches to control flow of electricity to the load at the instance of connect/ disconnect commands as per functional need of the system. b. Load switch for connect/ disconnect purpose shall be mounted inside the meter with suitable arrangement. c. Load Switches shall be provided for all phases and neutral d. The rating of switches used shall be in line with meter rating. e. All the switches shall operate simultaneously.
6.13.1	Performance requirement for load switching	a. Utilization category of the load switch shall be UC3 as per clause no. 5.6.6.2 of IS 15885. b. All load switches shall operate simultaneously.
6.14	Optical port	Meter shall have an optical port with a metal ring to hold magnet of probe. Optical port shall comply with hardware specifications provided in IEC-62056-21.
6.15	Communication Module Interface	a. Meter should have the provision for 01 no's plug in communication module for connectivity. The same interface shall be compatible with both Cellular and RF communication technologies interchangeable in field. b. Interface shall support data transfer between meter and network interface card over UART/ RS232. Bidder shall explain its pin out and standard in detail. c. Meter shall have mechanism to log communication module removal as an event in its memory with date and time stamp. d. Meter Vendor shall work with BRPL designated RF provider to integrate their module in the meter as per integration requirement mentioned in annexure 'C'. e. Preferred location of communication card module shall be on top of meter.
6.15.1	Communication modules	a. Smart meter shall have 01 no's plug-in type communication modules/ Network Interface card (NIC) for connectivity of meter to HES from following options as per tender requirement: i. Communication Module/ NIC Type 1: RF based suitable for communication Network of BRPL designated RF canopy provider. ii. Communication Module/ NIC Type 2: RF and Cellular communication module (LTE 4G

		with 3G and 2G fall back as per Indian telecom Standards). b. Meter shall have separate indications on display/ for remote and local communication. c. Communication module shall held in a casing which can be directly plugged in the meter. Sealing screw shall be provided.
6.16	Last Gasp	Meter shall have provisions to provides last gasp signals through communication module in case of power failure. Bidder should explain in detail the provisions provided in meter to achieve the requirement.
6.17	Meter Sealing Arrangement	Sealing should be in accordance with IS and CEA metering regulations with latest amendments. Approval shall be taken from purchaser for location of seals.
6.17.1	Manufacturer's Seals	a. One Polycarbonate seal to be provided on meter cover. b. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram).
6.17.2	BRPL Seals	a. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram). Meter sides should not have sharp edges to avoid damage to hologram seals. b. Minimum one Polycarbonate seal should be provided on top cover. c. Seals will be issued to manufacturer free of cost. d. 02 no's polycarbonate seals shall be provided for communication module.
6.17.3	Seal record	Record of all seals shall be forwarded to purchaser with each lot.
6.18	Name Plate and marking	a. Meter should have clearly visible, indelible and distinctly marked name plate in accordance with IS 16444 (Part 1) & clause no. 9.0 of this specification. b. All markings and details shall be printed by laser only. c. Paper stickers are not allowed for name plate.
6.19	Resistance against heat and fire	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.

6.20	Meter Box	As per Annexure 'E' if required in purchaser's requisition. Meter shall be factory fitted in meter enclosure by unidirectional screws.
6.21	Guarantee	a. 7.5 years from the date of dispatch or 7 year from date of commissioning, whichever is earlier b. Manufacturer shall undertake a guarantee to replace meter up to a period of 7 Year from the date of supply. The meters which are found defective/inoperative within the guarantee period, these defective/inoperative meters shall be replaced as per meter service level agreement.

7. Functional Requirement

SN	Item	Description
7.1	Meter category	Smart meter shall comply D2 category of IS 15959 (Part 2).
7.2	Mode of metering	It should be possible to configure meters in following modes of metering: a. Forwarded Only: In this mode any export active energy shall be treated as import energy and shall be recorded in forward only register. Apparent energy calculation in this mode shall be as per clause no. 6.5. b. Bidirectional: Both Import and export energy recording shall be applicable in this mode of metering and relevant registers shall be updated. Any change in metering mode shall be logged in events with date and time stamp. Default mode of metering shall be forwarded only untill specified in tender requirement otherwise.
7.3	Payment Mode	It should be possible to configure meter in following modes of payment: a. Post payment mode b. Prepayment Mode Any change in payment mode shall be logged in events with date and time stamp. Prepayment facility shall be achieved by server / HES. Default mode of metering shall be post payment untill specified in tender requirement otherwise.
7.4	KVAH Calculation	Lag only: KVAh is computed based on KVArh and KWH value. If PF=1, or leading, then KVAh = KWH.

		At no instance KVAh < KWh.
7.5	MD calculation	Block / sliding window with default demand integration period of 1800 s configurable to 900 s as per requirement. Meter should be configurable for block/ sliding window at the time of manufacturing. This change should not be possible in the field. Extended register shall be used for MD recording.
7.6	TOU Metering	a. Meter shall be capable of doing TOD metering in minimum 4 tariff rate registers programmable for minimum 8 time zones and 4 seasonal profiles. b. TOU metering shall be implemented by the activity colander method of IS 15959 Part 1 clause 9/ DLMS UA-1000-1 c. Special Day table shall be defined as per DLMS UA-1000-1 d. Default TOU programming shall be as per latest DERC guidelines. Prior approval shall also be taken from BRPL for the same. e. Tariff rate registers shall be as follow R1: Rate register for Peak R2: Rate register for Normal R3: Rate Register for Off Peak
7.7	Instantaneous Parameters	All the parameters mentioned in table 'A1' of IS 15959 along with following additional parameters shall be supported by meter. a. RF/ GSM signal Strength in milli db. b. % TDH in R phase Voltage c. % THD in Y Phase Voltage d. % THD in B Phase Voltage e. % THD in R phase Current f. % THD in Y Phase Current g. % THD in B Phase Current h. Displacement PF i. GPS Coordinates j. Temperature Method of Harmonic Measurement shall confirm to the IEEE 519 2015.
7.7.1	Association Rights	As per Clause 11.1.1 of IS 15959 (Part 2).

7.8	Billing data	a. Billing parameters shall be generated at the end of each billing cycle and stored in memory as per provisions provided in clause no. 14 of IS 15959 (Part 2). b. 6 no's billing cycle parameters shall be remain in meter memory along with current cycle parameters and shall be available for reading as well as profile and or 'by entry' for selective access. c. All the parameters mentioned in table 'A4' of IS 15959 (Part 2) shall be supported by meter.
7.8.1	Association Rights	As per clause 14 of IS 15959 (Part 2).
7.8.2	Selective access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.8.3	Billing period reset/ MD reset	00:00 Hrs of Ist of every month
7.8.4	Billing period reset mechanism	As per clause 10 of IS 15959 (Part 1)
7.8.5	Billing period counter	Cumulative billing period counter since installation and available billing periods shall be provided as per clause 11.2 of IS 15959 (Part 1).
7.9	Load survey Data	a. Load survey parameters shall be measured and recorded at the end of each profile capture period for last 35 Power ON days. b. All the parameters mentioned in table 'A15' of IS 15959 (Part 2) along with following additional parameters shall be supported by meter: % THD in R phase Voltage % THD in Y Phase Voltage % THD in B Phase Voltage % THD in R phase Current % THD in Y Phase Current % THD in B Phase Current
7.9.1	Association Rights	As per clause 18 of IS 15959 (Part 2)
7.9.2	Profile capture period	Default 1800 s programmable to 900 s.
7.9.3	Selective Access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).

7.10	Daily load profile	Daily load profile parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 35 Power On days. All the parameters mentioned in table 'A16' of IS 15959 (Part 2) shall be supported by meter as Daily load profile parameters.
7.10.1	Association rights	As per clause no 19 of IS 15959 (Part 2).
7.11	General Purpose Parameters	Following parameters shall be provided in Non Volatile memory (NVM) of the meter as per clause 16 of IS 15959 (Part 2).
7.11.1	Name Plate Detail	As per Table 'A26' of IS 15959 (Part 2) with following additional parameters. a. Month of manufacturing.
7.11.2	Association rights	As per clause 22.1 of IS 15959 (Part 2).
7.11.2	Programmable parameters	These 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. Programming of any of the parameters shall increment the 'Cumulative programmable count' value. All the parameters mentioned in table Table 'A27' of IS 15959 (Part 2) shall be supported by meters with following additional parameters. a. Time trigger value for stamp event.
7.11.2.1	Association rights	As per clause 22.2 of IS 15959 (part 2)
7.11.3	Push Services	a. Smart meter is able to automatically notify data, event, and messages to a destination client system in an unsolicited manner (without a request from a client) as per clause no 6 of IS 15959 (Part 2). b. Randomization: Data from different endpoints shall be pushed intelligently on the network in order to avoid excessive traffic on the network for example in case all the endpoints will push load survey data simultaneously, then it may result in network choking or inefficient performance. Therefore with the help of intelligent techniques such field scenarios shall be handled effectively. c. It shall also be possible to configure push services for all profiles i.e instantaneous, billing, load survey, daily energy and events. Bidder

		should explain its capability to configure push services. However following push services shall be available by default. i. Load survey profile data at after every 4 hours configurable to any predefined interval. ii. Mid night data at 00:00 hrs of every day. iii. Billing profile data on occurrence of billing.
7.11.3.1	Periodic push (Smart meter to HES)	a. Meter shall be able to push instantaneous parameters to HES at predefined intervals. Parameters required for push shall be intimated during detailed engineering in the vent of order. 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.
7.11.3.2	Event Push (Smart meter to HES)	a. Meter is able to report HES, the status change of any of the identified events mapped in to event status word (ESW) of size 128 bits by pushing following objects to HES. i. Device ID ii. Push Setup ID iii. Real time clock- Date and Time iv. Event Status Word 1 (ESW 1). b. Each of the bits in ESW shall reflect the current state of the event and are mapped against each of the identified events. c. An event status word filter (ESWF) of 128 bit shall also be provided to configure events for event push. Events which are supported in meter shall only be configured for event push. Bit value 1 in ESWF shall indicate that the event is supported and value 0 indicates that event is not supported for event push. Position of the event bit in ESWF shall be same as in ESW.
7.11.3.3	Event status Bit mapping	As Per IS 15959 (Part 2)

7.12	Firmware upgrade	a. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. b. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3. c. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. d. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade. e. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory. f. Meter shall support capability to self register the meter with new firmware. g. The execution time of the change of the firmware within the meter should be below 1 minute
7.13	Support for broadcast message	Meter shall support connection less messaging services of DLMS to support broadcast messages for a group of meters for following actions: a. Gap reconciliations. b. Firmware upgrade. c. On demand readings. d. Meter connection and disconnection. e. Updating of Programmable parameters.
7.14	Disconnection mechanism	a. The Smart meter shall support disconnection (all the switches shall operate simultaneous) on the following conditions as per clause 11 of IS 16444 (Part 1): i. Over current (105 % of Imax in any element for predefined persistence time.) ii. Load control limit (Programmable) iii. Pre-programmed tamper conditions (Factory programmed) iv. Disconnection signal from Head end system. v. Pre paid function for prepayment mode.

		b. Meter shall use the disconnection control object as defined in clause 10 of IS 15959 (Part 2). c. Load limit function shall be disabled by default until other specified.
7.15	Local reconnection mechanism	a. Meter shall be able to reconnect load switches locally only for Overload and load control limit disconnections. b. The meter will try to reconnect the load up to predefined time, with predefined interval (Time and interval is programmable). c. If the consumption is still more than the programmed limits, it will lock out and wait for 30 minutes. d. If the consumption is still above the limit, the procedure defined above in 1 and 2 shall be repeated. e. It shall be possible to remotely connect/disconnect the relay via commands from HES. The remote reconnect shall not interrupt the normal connect/disconnect cycle. f. In case of relay malfunction i.e., connect/disconnect action of relay is not taking place due to welding of contacts or any other reason, then it shall be logged as an event in the Non-rollover compartment. Same shall be sent as an alert to HES. g. Remote command shall have priority over local communication.
7.16	Reconnection mechanism	a. Reconnection shall be done from HES except for over current and load control limit. In case of failure of communication / HES, reconnection shall be possible through Hand Held Device (CMRI) locally via proper security. b. Reconnection in case of prepayment meter shall be as per prepayment profile.
7.17	Status of load switch	Indication of status of relay i.e. connected/ disconnected should be available on display as well as through communication to HES. Connection and disconnection should be logged as events.

7.18	First breath and last gasp	a. Indication of status of relay i.e. connected/ disconnected should be available on display as well as through communication to HES. b. Connection and disconnection should be logged as events.
7.19	Security	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided.
7.19.1	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
7.19.2	Encryption/ Authentication for data transport	As per clause 7.2 of IS 15959 (Part 2)
7.19.3	Key requirement and handling	As per clause 7.3 of IS 15959 (Part 2)
7.19.4	NIC Security	a. Proper security at end points as well as network level shall be present to prevent unauthorized hacking of the end points or the network itself. b. The meter password is required to open a session between NIC and meter and is required to gain clearance from the meter to perform requested operation. c. If clearance not gains, the meter locks out communication for 1 minute. The meter maintain counter for monitoring of unsuccessful attempts of performing meter operations and alerts to HES. The counter is incremented each time a password clearance operation fails. d. Up to 3 no's successful attempts are allowed, after which the port is locked out until authenticated from system administrator.
7.20	IP communication profile support	Meter shall support TCP-UDP/ IP communication profile for smart meter to HES. Please refer clause 8 of IS 15959.
7.20	Consumer display unit (Optional)	Provision of consumer interface unit (CIU) to access meter from consumer premises. Wireless IHD powered by battery.
7.21	Event and tamper detection	Meter shall detect and log any exceptional/ fraud/ tamper conditions in its memory as an event. In addition to this all transactions and control shall also be recorded as an event in meter memory. Each event type shall be identified by an event ID.

7.21.1	Association Rights	Each event shall be available to download as per following association rights. a. Public Client: No access b. Meter Reader: Read only c. utility Settings: Read only d. Push Services: Read Only for identified events as per ESWF
7.21.2	Compartments of events	Meter shall be able to log events in following compartments a. Voltage Related Events b. Current Related Events c. Power Related Events d. Others Events e. Non Roll Over Events f. Transaction related events g. Control Events
		Occurrence and Restoration of Voltage Related, current related, power related and other events shall be logged in meter memory as per IS 15959 (Part 2). Please refer annexure 'A' for description of events, Event ID, Logics of events and threshold values of events.
		Threshold values shall be factory programmable.
		Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1).
		For each of the events a certain list of parameters shall be captured as per clause 'a'
		For each occurrence event captured, the cumulative tamper count shall be incremented.
		Only Real clock (date and time) and event code shall be captured events in compartments mentioned at sl no. 'd', 'f', 'g', 'h'.
7.21.3	Parameter Snapshot	Following parameters mentioned above are to be captured when event occurrence and restoration is logged as per IS 15959 (Part 2). a. Date and time of event b. Event code c. R Phase Current d. Y Phase Current e. Y Phase Current f. Neutral Current g. R Phase Voltage h. Y Phase Voltage

		i. B Phase Voltage j. Three Phase Power factor k. Cumulative energy- kWh
7.21.4	Event Logging	The meter shall log minimum 100 tamper events (ensuring at least 20 events for each tamper).
7.21.5	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
7.22	Phasor Representation	Meter shall support parameters required to develop phasors of current and voltage at HES.

8. Meter Display

SN	Item	Description
8.1	LCD Type	STN Liquid crystal with backlit
8.2	Viewing angle	a. Minimum 120 Degree. 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.
8.3	Size of LCD	Minimum 10X5mm
8.4	LCD Digits	Total 6+1 digits
8.5	LCD language	English
8.6	Display modes	a. Auto Mode b. Manual Mode c. Sub active mode Display list shall be finalized during detailed engineering in the event of order.
8.7	Display indications	Appropriate indications/flags for all tampers and self diagnostic features should be provided.

9. Data and Communication Protocol/ HES/ Integration/ Software

SN	Item	Description
9.1	Data Exchange protocol	a. Meter should comply Indian companion of data exchange and tariff control specification IS 15959 (Part 2). b. In case of additional requirement from IS 15959 (part 2), they shall be as per DLMS standards/ IEC DLMS protocols suite (62056). c. Bidder shall explain in detail the additional parameters/ services/ methods used in meters from IS 15959 (part 2)

		and its reference to DLMS books/ IEC. d. Prior to manufacturing of meters bidder shall provide a detailed specification explaining all parameters/ services/ methods used in meter in addition to IS 15959 (Part 2).
9.2	Integration with HES	a. Bidder shall work with BRPL IT team/ BRPL designated system integrator to integrate its meter with BRPL HES system. b. Bidder shall prepare detailed documents as mentioned in above clause and submit it for BRPL approval and integration with HES.
9.3	Base computer software	Licensed Software with the following features should be supplied for free to download meter through optical port.
9.3.1	Operating System	BCS should be compatible for latest Windows operating system.
9.3.2	Security	System shall be password protected where user can login only if login ID is provided by administrator. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
9.3.3	Database	BCS shall maintain master database according to desired area, location, and region etc.
9.3.4	Reporting	a. BCS shall have option of user defined report generation in format of Excel, Word and CSV, XML, PDF etc. b. BCS shall have capability to export data in ASCII, CSV and XML format at desired location so that the same could be integrated with our billing data for processing. c. All the data available in the meter shall be convertible to user defined ASCII, CSV and XML file format.
9.3.5	Data transfer rate	BCS and communication ports should support data transfer rate of 9600 bps (minimum).
9.4	Hand Held Unit Software	a. The manufacturer has to provide software capable of downloading all the data stored in meter memory through window/ android operating system based handheld units (HHU) through optical port. b. In the event of order, bidder shall work with BRPL IT team/ BRPL designated system integrator to develop HHU software for meter downloading and further uploading on HES. c. HHU software should have option for selection of parameters to be downloaded from meter. d. Meter data consisting of all parameters and complete load survey for all parameters shall be read by HHU and downloaded on HES in minimum possible time (not more than 5 minutes).

9.5	Training	Manufacture shall impart training to BRPL personnel for usage of software

10. Name Plate

SN	Description
10.1	Meter Serial number shall be of 8 digits. Serial number shall be printed in black colour. Embossing is not acceptable.
10.2	Size of the digit shall be minimum 5X3 mm
10.3	Bar code shall be printed along with serial number
10.4	BIS registration mark (ISI mark)
10.5	'BRPL' insignia shall be printed above LCD display.
10.6	BRPL PO No. & date
10.7	Manufacturers name and country of origin
10.8	Model type / number of meter
10.9	Month and Year of manufacturing
10.10	Reference voltage / current rating
10.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
10.12	Meter constant
10.13	Class index of meter
10.14	Reference frequency
10.15	Warranty period
10.16	Symbol of load switch
10.17	Name plate of NIC a. Serial no of NIC along/ IMEI no/MAC address with bar code b. Name of purchaser's c. Communication technology with carrier frequency d. Manufacturing year and month. e. Warranty period.

11. Component Specification

SN	Item	Description	Make
11.1	Current Transformers	The Meters should be with the current transformers as measuring elements.	The current transformer should withstand for the clauses under 5.18(t)
11.2	Shunt element	Data sheet should be submitted.	Reputed
11.3	Measurement or computing chips	The Measurement or computing chips used in the Meter should be	Analog Devices, Cyrus Logic, Atmel, Phillips,

		with the Surface mount type along with the ASICs.	SAMES ,NEC,TEXAS
11.4	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Hitachi, Compiled
11.5	Display modules	a) The display modules should be well protected from the external UV radiations. b) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). c) It should be STN type industrial grade with extended temperature range min 70 ºC.	Truly semiconductor, Tianma / Haijing Electronics, China, Hitachi,
11.6	Optical port	The mechanical construction of the port should facilitate the data transfer. Communication shall not disturbed by external light.	Everlight, Osram, Agillent, NFC
11.7	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 in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	
11.8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.	National Semiconductors, Atmel, Phillips, Texas Instruments. Hitachi, Compiled, AVX or Ricoh Samsung, EPCOS, Vishay
		LED	Everlight, Agillent
11.9	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc.	

		b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
11.10	Battery	Lithium with guaranteed life of 15 years	Texcell, SAFT, Varta
11.11	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas Atmel, Motorola, Microchip, TEXAS, NEC or Compiled
11.12	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)
11.13	Load Switch	Utilization Category UC2/ UC3 Latching relay Can withstand 120% of Vref and 120% of Imax current. As per IS 15884	Gruner/ KG/ any other reputed make subject to BRPL approval.
11.14	Note	a. The components used by manufacturer shall have "Minimum Life" more than the 10 years. b. Incase vendor want to use other make components; same shall be approved by BRPL before use. c. Even for existing supplier – fresh approval is needed for all deviations. d. Manufacturer should have complete tracking of material used in meter. BRPL reserve the right to carry out audit of inventory/ manufacturing process at manufacturer's works and sub vendor's work.	

12. Quality Assurance, Inspection and Testing

SN	Item	Description
12.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
12.2	Sampling Method	Sampling Method for quality checks shall be as per relevant IS/ IEC/ CBIP guidelines and Purchaser's prior approval shall be

		taken for the same.
12.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.
12.4	Type Tests	a. The meter shall be of type tested quality including all tests specified in this specification which are beyond IS / IEC or CBIP. b. Type test conducted from CPRI/ ERDA/ or any other lab specified by BIS/ CEA for smart meter testing will be treated as valid. c. Type test certificate should be submitted along with offer for scrutiny. d. Any other component supplied in addition to meter shall also be type tested as per IS /IEC if applicable. e. Complete type test as per IS 16444 (Part 1) shall be carried out on sample selected from BRPL lot.
12.5	Routine tests	All test marked "R" as per table 20 of IS 13779.
12.6	Acceptance Tests	a. All tests marked "A" as per table 20 of IS 13779. b. Smart meter functional tests as per IS 16444 Table 1 c. Test of load switch as per clause 10.4 of IS 16444 (Part 1) d. Test for data exchange protocol as per clause 10.5 of IS 16445. e. Test for Smart meter communicability as per clause no. 10.6 of IS 16444 (Part 1). f. All the routine and acceptance tests shall be carried out as per relevant standards. g. Following tests in addition to IS shall be conducted during lot inspection. I) Dimensional and drawing verification. II) Display parameters/ sequence. III) Data Downloading from CMRI and PC. IV) Tamper/ fraud detection/logging features as per approved documents. Tamper conditions will be simulated at varying load up to Imax. Accuracy will also be checked during tamper simulation. V) Burn in chamber test. VI) Component verifications. h. Purchaser reserves the right to formulate any other test method to verify guaranteed parameters of Meter.
12.7	ESD and Magnetic Interference test	ESD and magnetic interference test will be conducted at Samir lab, Chennai or CPRI.
12.8	Inspection	a. Purchaser reserves the right to inspect /witness all tests on

		the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards. b. Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per clause 15.3 relevant standards and tampers logics as per approved GTP. All the equipments including tamper logs kits/ jigs should be calibrated. c. In-process and / or final inspection call intimation shall be given in advance to purchaser.

13. Packing, Marking, Shipping, Handling and Storage

SN	Item	Description
13.1	Packing	a. Each meter must be packed, together with its terminal cover, in a separate environmental friendly cardboard box, which can be opened and re-closed without needing adhesives. b. Up to 4 to 5 three-phase meters must be packed together with their terminal covers in a group cardboard box, which can be opened and re-closed without needing adhesives. c. The box shall prevent, as much as possible, penetration of dust during long storage periods. The box must be designed for multiple use and be robust, with wall thickness of at least 4 mm. d. Maximum weight of a group meter box shall not be more than 25 Kg. e. The packaging will protect the meters against shock and vibration, preventing damage due to the road conditions during transport and distribution in the field. The electrical and mechanical properties shall not be affected by these disturbances. f. For shipping the boxed meters will be close packed by stockpiles of suitable quantities on pallets. The meters numbers sequence (without partition) shall be kept in each pallet. A pallet will be protected against moisture by a polyethylene hood, covered with a cardboard cover (hood), and fixed onto the pallet by parallel polypropylene bands, using protection angle bars at the corners. The hood shall be marked – on the front (wide side), on the narrow side and on the top as per clause 13.3.

		g. Each pallet should contain between 70 and 300 meters. The actual number of meters on each pallet will be agreed with the BRPL in the event of order. h. An impact detector ("Shock-Watch") label shall be attached to the cardboard hood of several pallets in each container/ transport truck, to warn of possible rough handling during shipment, transport and storage.
13.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label.
13.3	Marking	On each group box and pallet, following details are required both on front (wide side) and top: a. BRPL logo. b. Meter serial number range along with bar code. c. Unique number of box/ pallet. d. Purchaser's name e. PO number (along with SAP item code, if any) & date with bar code f. Equipment Tag no. (if any) g. Destination h. Manufacturer / Supplier's name i. Address of Manufacturer / Supplier / it's agent j. Type , rating and other description of equipment k. Country of origin l. Month & year of Manufacturing m. Case measurements n. Gross and net weights in kilograms o. All necessary slinging and stacking instructions
13.4	Test reports	Routine test report to be provided with each meter
13.5	Shipping	The seller shall be responsible for all transit damage due to improper packing.
13.6	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet /manual to be furnished before commencement of supply.

14. Deviations

14.1	Deviations	a. Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed.

		b. In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.

15. Drawing Submission

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

SL	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Tamper Sheet	Required	Required	
4	Display Parameters	Required	Required	
5	GA / cross sectional drawing of Meter showing all the views / sections	Required	Required	
6	Detail of network interface i.e. pin out, standard, voltage level etc and its integration requirement.	Required	Required	
7	Samples of each type and rating offered along with box and RF NIC/ communication module of already integrated RF card as per tender qualifying criteria.	4 no's (2 nos with box and 2 nos without box)	2 no's (01 no with box and 01 no without box)	
8	Any software and accessories required for installation/ operation of meter	Required	Required	
9	Manufacturer's quality assurance plan and certification for quality standards	Required		
10	Type Test reports of offered model/ type/ rating	Required		
11	BIS certificate	Required		
12	Complete product catalogue and user manual.	Required		
13	Customer Reference List	Required		
14	Recommended list of spare and accessories	Required		
15	Specification documents containing all parameters, Services, Methods in addition to companion specification of IS 15959 (part 2).		Required	
16	Program for production and testing (A)		Required	Required
17	Makes of components		Required	Required
18	Detailed installation and commissioning		Required	Required

	instructions			
19	As Built Drawing		Required	Required
20	Operation and maintenance Instruction as well as trouble shooting charts/ manuals		Required	Required
21	Inspection and test reports, carried out in manufacturer's works			Required
22	Routine Test certificates			Required
23	Test certificates of all bought out items			Required
24	Meter Seal data			Required
25	Mapping of meter serial no to Communication card.			Required

16. Delivery

16.1	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.

Annexure – A: Guaranteed Technical Particulars

Bidder shall furnish the GTP format with all details against each clause of this specification.
Bidder shall not change the format of GTP or clause description.
Bidder to submit duly filled GTP in hard copy format with company seal.

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

Bidder / Vendor seal / signature ----------

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number and email id	

Annexure – B: Recommended Accessories / Spares

SL	Description of spare part	Unit	Quantity
1		No	
2		No	
3			

Annexure – C: Integration Requirement of Meters with NIC and HES

Integration requirements with communication provider of BRPL/ any other agency designated by BRPL for other components of AMI.

a. Bidder(s) must share the meter security keys, all level encryption, and password information along with asset information in a format with the buyer / communication provider of BRPL so that during AMI business flow, the device and data can be authenticated all the time.
b. Bidder(s) must share the details of meter communication specifically programmed protocols.
c. Bidder(s) must share the meter configuration source code to the BRPL/ communication provider of BRPL.
d. Bidder (s) must share the meter interface touch points for external applications/ systems.
e. Bidder(s) must share the required APIs including but not limited to reading APIs, configuration APIs and Functional APIs with the System Integrator for execution of business flow (Installation, reading, configuration).
f. Bidder(s) must share the data storage and retrieval details.
g. Bidder(s) must configure the devices to be upgraded remotely (OTA) and share the required firmware source code (with updates over the project life) with system integrator as and when it is required in case of feature request or fault correction.
h. Bidder(s) must follow and conduct Utility's sample and periodic test program, including (but not limited to) the selection of a sample population of meters, sharing of sample test results as reported by the meter testing systems with the system Integrator.
i. Bidder(s) must share the information related to communication module for the authorization purpose at to BRPL/ communication provider of BRPL.

Annexure – D: Tamper and Fraud Detection Events

1. Voltage Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
R Phase Voltage Missing (Occurrence/ Restoration)	Absence of potential on any phase should be logged. Restoration of normal supply shall also be recorded. The threshold value of voltage should be programmable at factory end	Occurrence: If Vpn<10% Vref and Ip>10% Ib Restoration: If Vpn>=10% Vref and Ip>10% Ib	Occurrence: 5 Min Restoration: 5 Min
Y Phase Voltage Missing (Occurrence/ Restoration)			
B Phase Voltage Missing (Occurrence/ Restoration)			
Over Voltage (occurrence/ restoration)	Meter should log high voltage event if voltage in any phase is above a threshold value.	Occurrence: If Vpn>10% Vref Restoration: If Vpn<=10% Vref	Occurrence: 5 Min Restoration: 5 Min
Low Voltage (occurrence/ Restoration)	Meter should log low voltage event if voltage in any phase is below a thershold value.Thershold value if factory programmable.	Occurrence: If Vpn<75% Vref Restoration: If Vpn<=75% Vref	Occurrence: 5 Min Restoration: 5 Min
Voltage Unbalance (Occurrence/ Restoration)	Meter should log voltage imbalance event when the difference between minimum and maximum phase voltage is more than a thershold value.Thershold value if factory programmable.	Occurrence: If Vmax-Vmin>30% Vref Occurrence: If Vmax-Vmin<=30% Vref	Occurrence: 5 Min Restoration: 5 Min
R Phase voltage Harmonics	Meter should log occurrence of high voltage harmonic event when % THD in voltage of phase will be more than threshold value. Threshold value should be factory	Occurrence: If % THD in I_P>5% of fundamental. Restoration: If % THD in I_P <5% of fundamental.	Occurrence: 5 Min Restoration: 5 Min
Y Phase Voltage Harmonics			
B Phase Voltage Harmonics			
2. Current Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**

Current Reverse/ R Phase Current Reverse (occurrence/ Restoration)	Meter should log the event of reversal of C.C polarity. Meter should register energy consumed correctly with any one, two or all three current coils reversed. This event shal not be valid in bidirectional mode of metering.	Occurrence: If Ip = -ve direction Restoration: If Ip=+ve direction	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Reverse (occurrence/ Restoration)			
B Phase Current Reverse (occurrence/ Restoration)			
R Phase Current Open (Occurrence/ Restoration)	Meter should log the event of current coil open. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)>20% *Ib and I<10% Ib* *Vector Sum($I_R+I_Y+I_B+I_N$)>20% Ib*	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Open (Occurrence/ Restoration)			
B Phase Current Open (Occurrence/ Restoration)			
Current Unbalance (Occurrence/ Restoration)			
Current Bypass (Occurrence/ Restoration	Meter should log the event of current coil shorting/bypass. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)>20% *Ib and I (any Phase) >5% Ib* *Vector Sum($I_R+I_Y+I_B+I_N$)>10% Ib*	
Over current (occurrence/ restoration)	If the current in any phase exceeds the specified threshold current, meter should log over current event.	Occurrence: If Ip>Imax Restoration: If Ip<=Imax	Occurrence: 5 Min Restoration: 5 Min
R Phase high Current Harmonics	Meter should log occurrence of high current harmonic event when % THD in current of phase will be more than threshold value. Threshold value should be factory	Occurrence: If % THD in I_P>5% of fundamental. Restoration: If % THD in I_P <5% of fundamental.	Occurrence: 5 Min Restoration: 5 Min
R Phase high Current Harmonics			
R Phase high Current Harmonics			
3. Power Related Events:			

Description of event	Logic Of Event	Logic Expression/ Threshold values	Persistence Time
Power OFF (occurrence/ restoration)	Meter shall detect power OFF if all phase voltages are absent. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded.		
Abnormal Power Off (Occurrence/ restoration)	If meter micro detect power off whereas phase voltage is present than abnormal power will be recorded. Meter sall continue to record energy as per phase voltage and current.	Occurrence: If voltage at meter power supply<10% vref and Vp>20% vref. Restoration:	NA
4. Other Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Abnormal External Magnetic Influence (Occurrence/ Restoration)	a. Meter should either be immune or should log the events of attempt of tampering by external magnetic field as per relevant IS13779/ CBIP 325 with latest amendments. b. If the working of meter gets affected under the influence of external magnetic field, meter should record energy at Imax. Meter should not compute MD during this period. The meter shall record energy as per actual load once the magnetic field is removed.	As per IS 13779/ CBIP 325	As per IS 13779
Neutral Disturbance- HF, DC and Alternating	Meter should log the event when AC/DC/ Pulsating voltage is injected in neutral	As per manufacturing standard.	Bidder shall define threshold values

(occurrence/ restoration)	circuit.		
Low Power Factor	Meter shall able to detect and log the low PF event if power factor of the load found between 0.2 to 0.5 for a load above than a % thershold value for a thershould time value. Event shall restore if PF factor of load remain out of range 0.2 to 0.5 for a load ablove than % thershould value for		
Plug in Communication module removal (Occurrence/ Restoration)	Meter should log the removal of communication card. Meter should also log insertion of communication card.	By NC switch/ sensor	
Configuration change to post-paid mode/ pre-paid mode	Meter should log the change in payment mode configuration.		
Configuration change to “Forwarded” only" mode/ “Import and Export” mode	Meter should log the change in metering mode configuration.		
Overload (Occurrence/ Restoration)	Meter should able to log the status of overload in KW		
HV Spark (Occurrence/ restoration)/ Jammer	Meter with communication card should be immune or log the event in the case of application of ESD upto and including 35 KV.	Immediately	NA
High neutral Current	Meter should log event of high neutral current if measured neutral current should be more than predefined threshold value.	Occurrence: If I_N > 50% of average phase current Restoration: If I_N < 50% of average phase current	Occurrence: 5 Min Restoration: 5 Min
Distorted PF	Meter shall log the event if		Occurrence: 5 Min

	difference between displacement PF and actual PF is more than a predefined value		Restoration: 5 Min
Time Based Event Stamp	Meter shall log voltage, current, PF and energy consumption on a predefined time	As per predefined time	NA

5. Non Roll over events:
Event Description
Occurrence of cover open
6. Transaction Related Events:
Detail of Transaction
Real Time Clock- Date and Time
Demand Integration Period
Profile Capture Period
Single Action schedule for billing date
Activity calander for time zones
New firmware activated
Load Limit (Kw) Set
Enable Load Limit Function
Disable load limit function
LLS secret (MR) change
HLS key (US) change
HLS key (FW) change
Global key change
ESWF change
MD reset
7. Control Events
Event Description
Load Switch Status- Disconnected
Load Switch Status- Connected

Note:

1. Event ID's shall be defined as per BRPL specification/ IS 155959 (part 2). Approval shall be taken from BRPL prior to manufacturing for Event ID's
2. Programming of threshold values should be possible from remote via proper authentications.
3. Logics of tampers can be changed/ upgraded via firmware up gradation from remote via proper authentication.
4. All the programming changes/ firmware up gradations shall be logged along-with date and time stamp in meter as well as on HES.

Annexure – E: Meter Enclosure

SL	Clause	Clause Description
1.0	Meter Box Type	Flush type with Completely transparent top cover and base with Incoming and Outgoing cable entry and data downloading arrangement.
2.0	Design	Meter box shall comply following requirement.
2.1	General Requirement	The meter box shall be designed in such a way that no access to the meter body, terminals and hardwired port of the meter shall be possible after installation and sealing of the box without breaking the box itself.
2.2	Theft Protection	a. Meter box shall be theft proof i.e. meter box cannot be opened without breaking the seals or meter itself. b. On breaking of the box, clear evidence of the physical tempering shall be visual.
2.3	Parts of the box	a. The meter box shall be designed in 02 parts i.e. base and top cover. b. Meter shall be mounted inside the base on fixed moulded pillars by unidirectional screw. c. Meter top cover should be hinge type. d. Cable glands and earthing bolt shall be provided at the base as per construction requirement. e. Proper stiffeners shall be provided in the body of the base and top cover to provide mechanical strength against transportation and installation vibrations.
2.4	Ingress protection	The meter box shall be completely dust and vermin proof. Ingress protection rating of the box shall be minimum IP55.
2.5	Collar of base and cover	a. A 'U' shaped groove shall be provided in the collar of the base body, in which UV stabilized rubber 'O' shall be installed. The design of lining shall be such that it provides proper sealing between the cover & base of box to avoid penetration of dust and ingress of water. b. All around projection provided inside the cover periphery which keeps the ‘O’ ring pressed. c. An outside collar shall also be provided, which shall cover outer surface of the collar.
2.6	Fixing of 'O' ring	a. Rubber ‘O’ Ring should be fixed with suitable adhesive so that the same does not get removed. b. Rubber 'O' ring shall be fixed in a single piece without any gap between open ends. Open end of the 'O' ring shall be provided at the bottom side only.
3.0	Material	The material shall be as follow:

SL	Clause	Clause Description
3.1	Box material	a. The material of meter box shall be flame retardant with inflammability level V0 having good dielectric and mechanical strength. b. The top Cover and Base of the box shall be made out of transparent polycarbonate with minimum 90% visibility so as to ease installation and monitoring of box against any tampering. The material shall be 'UV' stabilized to ensure that the moulded meter box should not change in colour, shape, size or should not get brittle after exposure to UV rays.
3.2	Hardware	All the metal hardware including hinges, U latches, mounting screws, downloading port ring etc shall be of rust proof stainless steel.
3.3	Cable glands	Polyamide Nylon-66 with flammability class FV0
4.0	Construction	a. Meter box shall be constructed by moulding of polycarbonate material as specified in clause no. 3.1 b. Thickness of meter box shall be minimum 2.0 mm.
4.1	Moulding	The box shall be made through Injection Moulding or better method.
4.2	Base	Meter shall be factory fitted inside base body using unidirectional screws, on fixed mounting pillars, moulded in to the base of sufficient strength, so that removing of meter shall not possible without breaking the meter box or meter itself.
4.3	Top cover	Hinge type
4.3.1	Hinge type	a. Minimum 02 no's concealed / internal hinges, not visible or accessible from outside the box without breaking the box itself. b. Minimum 02 no's U latches shall be provided to closed the box with sealing arrangement at each U latch. c. After closing the U latches no play/ gap shall exist between base and top cover.
5.0	Padlocking	The box shall also have padlocking facility.
6.0	Cable entry	a. 02 no's as incoming and outgoing at the 45 Deg Chamfer bottom corners suitable for 4CX50 Sqmm armoured aluminum cable. b. Cable entry must be at the bottom diagonal ends of the meter box. Appropriate clearance shall be provided between the cable entry and position of meter terminals for proper cable bending and connection. c. Minimum 60 mm vertical space shall be provided from the terminals of meter to centre of cable gland to provide

SL	Clause	Clause Description
		sufficient bending radius and working space.
6.1	Cable Gland	a. Two nos. of Elbow shaped glands made out of Polyamide Nylon-66 suitable for 4CX25 / 2CX50 sqmm aluminium armoured cable shall be provided on both cable entries in the box. b. Glands shall be designed in such a manner that the same cannot be unscrewed / removed from the box from outside. Manufacturer may either supply two nos. of check nuts or any other alternate design to meet this requirement.
7.0	Earthing bolt	a. Earthing bolt of M6 with nut and washer shall be provided on left side of the body of meter box. b. The arrangement shall be such that one earth point shall be available for customer and external earthing provided by BRPL can be terminated. c. Necessary symbol shall be provided for earth terminal.
8.0	Mounting	Mounting arrangement shall be as follow
8.1	Meter mounting pillars	a. Fixed type, moulded in to the base body as per the requirement of meter mounting holes. b. Stiffeners shall be provided at the base of the mater mounting pillars.
8.2	Meter box mounting	a. Four (4) nos. fixing holes of 6 to 6.5 mm diameter at the back surface of box shall be provided to fix the same on flat wall. b. Mounting holes shall not be obstructing by Incoming or Outgoing cables.
8.3	Box Mounting spacers	04 no's, 25 mm minimum mounting spacer moulded at the mounting holes of back surface of the meter box in order to provide space between meter back surface and wall.
8.4	Box Mounting accessories	Long pan head self taping SS screws and washers shall be provided by the supplier with every box. 4 no's plastic fixing plugs suitable for self tapping screws shall also be provided.
9.0	Data Downloading arrangement	a. Option 1: a. Slot for optical head with non removable corrosion ferromagnetic metal ring. b. Data downloading shall not be affected by scratches on data downloading port or with ageing of box. c. Data downloading shall not be affected by visible light conditions. b. Option 2: a. DB9 RS232 connector shall be provided at the top cover of box to download meter as specified in

SL	Clause	Clause Description
		clause no. 9.1 b. Meter shall be downloadable without opening of the box/ breaking of seals. c. This arrangement shall not de-rate the IP rating of meter box. d. A Top hinges and bottom sealable cover shall be provided on the data downloading slot. e. Data downloading shall not be affected by visible light conditions.
9.1	Optical to RS232 cable (If option 2 as per clause no. 9.0	Optical reader with 9 pin D-type female connector cable shall be provided in each meter box. Push fit type protective cover with sealing arrangement for data downloading port on the cover of the meter box has to be provided. The optical meter reader with 9 pin D-type female connector cable of all the meter boxes (100%) shall be tested for meter downloading before dispatch.
10.0	Marking	Following marking shall be provided on both top cover and base by fine quality indelible laser printing/ screen printing or embossed from inside of the box. a. BRPL insignia shall be embossed on the base & cover of meter box. b. Meter serial no. (Both on base and cover of meter box) c. Purchaser's PO no. and date. d. Purchaser's Name. e. Name or trade mark of seller f. Any other detail required at the time of approval.

Technical Specification for LT-CT Smart Meter

Document number: BR/18-19/SM/LTCT/01

June 2018

Prepared By	Reviewed by	Approved By
Md. Akhtar Ansari 5.6.18	05/06/18	05/06/18
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Index

Record of Revision

Item/Clause No.	Change in Specification	Reason of Change	Approved By	Rev

1. Scope of Supply

This specification covers the following for Three Phase 240 V, 5A-10A AC Static transformer operated Watt hour and Var Hour smart meters of accuracy class 0.5s with plug in communication module (RF mesh only and RF + Cellular technology).

A. Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.

B. Any accessories / hardware required for installation and operation for the meter.

2. Codes and Standards

Materials, equipment and methods used in the manufacturing of above mentioned equipment shall conform to the latest edition/ of following

S No.	Standard Number	Title
2.1	Indian Electricity Act	IE Act 2003
2.2	CEA Metering Regulations	With latest amendments
2.3	CBIP Manual (Pub no.-325)	Standardization of AC Static Electrical Energy Meters
2.4	IS- 16444 (Part 2)	AC Static Transformer Operated Watt-hour And Var-hour Smart Meters, Class 0.2 S, 0.5 S And 1.0 S Part 2 Specification Transformer Operated Smart Meters
2.5	IS- 14697	ac Static Transformer Operated Watt-hour and Var-hour Meters, Class 0.2 S and 0.5 S
2.6	IS-15959 (Part 1)	Data Exchange for Electricity Meter - Reading Tariff and Load Control - Companion Specification
2.7	IS-15959 (Part 2)	Data Exchange for Electricity Meter - Reading Tariff and Load Control (Part 2)- Companion Specification for smart meter
2.8	IS-15959 (Part 2)	Data Exchange For Electricity Meter Reading, Tariff And Load Control- Companion Specification Part 3 Smart Meter (Transformer Operated Kwh And KVARh Class 0.2 S, 0.5 S And 1.0 S
2.9	IS- 11448	Application guide for AC Electricity meters
2.10	IEC- 62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
2.11	IEC- 62053-21	Electricity metering equipment (A.C) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
2.12	IEC- 62053-52	Electricity metering equipment (AC) - Particular requirements - Part 52: Symbols
2.13	IEC 62053-61	Electricity metering equipment (A.C.) - Particular requirements - Part 61: Power consumption and voltage requirements

2.14	IEC 62058-11	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
2.15	IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
2.16	IEC 60736	Testing Equipment for electrical Energy meter
2.17	IS/IEC/TR 62051:Part 1:2004	Electricity Metering — Data Exchange For Meter Reading, Tariff And Load control — Glossary Of Terms Part 1 Terms Related To Data Exchange With metering Equipment Using DLMS/ COSEM
2.18	IEC 62056-1-0:2014	Smart metering standardisation framework
2.19	IEC 62056-3-1:2013	Use of local area networks on twisted pair with carrier signalling
2.20	IEC 62056-4-7:2014	DLMS/COSEM transport layer for IP networks
2.21	IEC 62056-5-3:2017	DLMS/COSEM application layer
2.22	IEC 62056-6-1:2017	Object Identification System (OBIS)
2.23	IEC 62056-6-2:2017	COSEM interface classes
2.24	IEC 62056-6-9:2016	Mapping between the Common Information Model message profiles (IEC 61968-9) and DLMS/COSEM (IEC 62056) data models and protocols
2.25	IEC 62056-7-3:2017	Wired and wireless M-Bus communication profiles for local and neighbourhood networks
2.26	IEC 62056-7-5:2016	Local data transmission profiles for Local Networks (LN)
2.27	IEC 62056-7-6:2013	The 3-layer, connection-oriented HDLC based communication profile
2.28	IEC TS 62056-8-20:2016	Mesh communication profile for neighbourhood networks
2.29	IEC TS 62056-9-1:2016	Communication profile using web-services to access a DLMS/COSEM server via a COSEM Access Service (CAS)
2.30	IEC 62056-9-7:2013	Communication profile for TCP-UDP/IP networks
2.31	IEC 62056-21:2002	Direct local data exchange
2.32	DLMS- White Book	Glossary of DLMS/COSEM terms
2.33	DLMS- Blue	COSEM meter object model and the object identification system

	Book	
2.34	DLMS- Green Book	Architecture and protocols to transport the model
2.35	DLMS- Yellow Book	Conformance testing process
2.36	IEEE 802.15.4	Standard for Local and metropolitan area networks.
2.37	IEEE 802.15.4u	Standard for Local and metropolitan area networks (Use of the 865 MHz to 867 MHz Band in India)
Order of precedence between different standards shall be as follow:		
i	Indian Standards Issued By BIS	
ii	IEC standard	
Iii	Other standards like CBIP, DLMS etc.	

3. Service Conditions

SN	Item	Description
3.1	Temperature Range	Operation range: -10 Deg C to 55 Deg C Limit range of operation: -25 to 60 Deg C Limit range of storage / transport : -25 to 70 Deg C
3.2	Relative Humidity	0 to 96 %

4. Distribution System Data

SN	Item	Description
4.1	Supply	3 Phase AC, 4 wire
4.2	Voltage	415 V ± 6%
4.3	Frequency	50 Hz ± 5%
4.4	System Neutral	Solidly Earthed

5. Electrical and Accuracy Requirement

SN	Item	Description
5.1	Meter Type	a. 3- ø, 4 wire static Transformer Operated Smart Meter without LTCT box. b. 3- ø, 4 wire static Transformer Operated Smart Meter with LTCT box as per annexure 'E'
5.2	Connection	Current Transformer Operated
5.3	Rated Voltage	240V (phase to neutral) with variation of +30% & -40%. However meter should withstand the maximum system

		voltage.
5.4	Rated Current	Ib -5A and Imax- 10 A
5.5	Starting current	0.1 % of base current
5.6	Rated Frequency	50Hz +/- 5%
5.7	Accuracy Class	0.5s (IS14697 applies for accuracy requirements)
5.8	Power Consumption	As per IS 16444 (Part 2) Meter with lowest power consumption shall be preferred.
5.9	Meter constant	Imp/ unit (Bidder to specify meter constant)
5.10	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.11	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.12	Influence of supply voltage	As per IS 14697
5.13	Short time over current	As per IS 14697
5.14	Immunity to phase and earth fault	As per IS 14697
5.15	Influence of Self Heating	As per IS 14697
5.16	Influence of Heating	As per IS 14697
5.17	Electromagnetic compatibility	a. Meter shall remain immune to electrostatic discharge (upto and including 35KV), electromagnetic HF field and fast transient burst. b. The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not influence the meter. c. Meter shall be type tested for electromagnetic compatibility. d. Meter shall comply requirement of IS 14697

5.18	Limits of error due to influence quantities	Meter shall work within guaranteed accuracy as per IS 14697/ IEC62053-21/ CBIP325 (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: BRPL reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.

6. Construction Feature

SN	Item	Description
6.1	Base Body	Material - Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level.
6.2	Top Cover	a. Material: Transparent/Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level. b. Top cover and base should be Ultrasonically/Chemically welded.

6.3	Terminal Block	a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent. b. Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135C and pressure of 1.8MPa. The terminals shall be designed so as to ensure adequate and durable contact such that there is no risk of loosening or undue heating.
6.4	Terminal cover	a. Material - UV stabilized transparent/Opaque polycarbonate cover. b. Provision of sealing at two points through sealing screw. c. The sealing screws shall be held captive in the terminal cover. d. The terminal cover shall be extended type 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. Terminal cover should have provision for cable entry from bottom. e. Diagram of external connections should be embossed on terminal cover. Sticker is not acceptable. f. Mechanism shall be provided to record an event with occurrence and restoration in case of meter enclosure/ terminal cover is opened.
6.5	Terminals	a. Terminals shall be suitable for 6 Sqmm copper wire. b. Two no's flat head screws per terminal shall be provided c. Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % Imax. d. Terminals shall be clearly marked for phase / neutral / outgoing etc. e. Clearances and creepage shall be as per IS 14697.
6.6	Meter Enclosure	a. Polycarbonate meter enclosure and LTCT's as per annexure 'E' shall be provided with meter. b. Mechanism shall be provided to record an event with occurrence and restoration in case of meter enclosure is opened.
6.7	Ingress Protection	IP 55 or better, but without suction in the meter.
6.8	Output device	Meter should 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.
6.9	RTC	a. The meter shall have internal real time crystal clock to set date and time. b. Drift in time of this clock shall not be more than ±5minutes/ year at a reference temperature of 27°C. c. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. d. HES will sync RTC at least once a day.
6.10	Battery	Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Lithium thioyl Chloride battery will be preferred. In case battery removal or total discharge same should not affect the working & memory of the meter.
6.11	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power.
6.12	Self Diagnostic feature	Meter shall have self diagnostic for the following a. Date and RTC. b. Battery. c. Non volatile memory. d. Display e. Status of Communication card
6.13	Optical port	Meter shall have an optical port with a metal ring to hold magnet of probe. Optical port shall comply with hardware specifications provided in IEC-62056-21.
6.14	Communication Module Interface	a. Meter should have the provision for 01 no's plug in communication module for connectivity. The same interface shall be compatible with both Cellular and RF communication technologies interchangeable according to the site. b. Interface shall support data transfer between meter and network interface card over UART/ RS232. c. Meter shall have mechanism to log communication module removal as an event in its memory with date and time stamp. d. Meter Vendor shall work with BRPL designated RF provider to integrate their module in their meter. e. Preferred location of communication card module shall be on top of meter

6.14.1	Communication modules	a. Smart meter shall have 01 no's plug-in type communication modules/ Network Interface card (NIC) for connectivity of meter to HES from following options as per tender requirement: i. Communication Module/ NIC Type 1: RF based suitable for communication Network of BRPL designated RF canopy provider. ii. Communication Module/ NIC Type 2: RF and Cellular communication module (LTE 4G with 3G and 2G fall back as per Indian telecom Standards). b. Meter shall have separate indications on display/ for remote and local communication. c. Communication module shall held in a casing which can be directly plugged in the meter. Sealing screw shall be provided.
6.15	Last Gasp	Meter shall have provisions to provide last gasp signals through communication module in case of power failure. Bidder should explain in detail the provisions provided in meter to achieve the requirement.
6.16	Meter Sealing Arrangement	Sealing should be in accordance with IS and CEA metering regulations with latest amendments. Approval shall be taken from purchaser for location of seals.
6.16.1	Manufacturer's Seals	a. One Polycarbonate seal to be provided on meter cover. b. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram).
6.16.2	BRPL Seals	a. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram). Meter sides should not have sharp edges to avoid damage to hologram seals. b. Minimum one Polycarbonate seal should be provided on top cover. c. Seals will be issued to manufacturer free of cost. d. 02 no's polycarbonate seals shall be provided for communication module.
6.16.3	Seal record	Record of all seals shall be forwarded to purchaser with each lot.

6.17	Name Plate and marking	a. Meter should have clearly visible, indelible and distinctly marked name plate in accordance with IS 16444 (Part 2) & clause no. 10.0 of this specification. b. All markings and details shall be printed by laser only. c. Paper stickers are not allowed for name plate.
6.18	Resistance against heat and fire	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 14697.
6.19	Guarantee	a. 7.5 years from the date of dispatch or 7 year from date of commissioning, whichever is earlier b. Manufacturer shall undertake a guarantee to replace meter up to a period of 7 Year from the date of supply. The meters which are found defective/inoperative within the guarantee period shall be replaced as per meter service level agreement.

7. Functional Requirement

SN	Item	Description
7.1	Meter category	Smart meter comply with D3 category of IS 15959 (Part 3).
7.2	Mode of metering	It should be possible to configure meters in following modes of metering: a. Forwarded Only: In this mode any export active energy shall be treated as import energy and shall be recorded in forward only register. Apparent energy calculation in this mode shall be as per clause no. 6.4. b. Bidirectional: Both Import and export energy recording shall be applicable in this mode of metering and relevant registers shall be updated. Any change in metering mode shall be logged in events with date and time stamp. Default mode of metering shall be forwarded only untill specified in tender requirement otherwise.
7.3	KVAH Calculation	Lag only: KVAh is computed based on KVArh and KWH value. If PF=1, or leading, then KVAh = KWH. At no instance KVAh < KWh.

7.4	MD calculation	Block / sliding window with default demand integration period of 1800 s configurable to 900 s as per requirement. Meter should be configurable for block/ sliding window at the time of manufacturing. This change should not be possible in the field. Extended register shall be used for MD recording.
7.5	TOU Metering	a. Meter shall be capable of doing TOD metering in minimum 4 tariff rate registers programmable for minimum 8 time zones and 4 seasonal profiles. b. TOU metering shall be implemented by the activity colander method of IS 15959 Part 1 clause 9/ DLMS UA-1000-1 c. Special Day table shall be defined as per IEC/ DLMS UA-1000-1 d. Default TOU programming shall be as per latest DERC guidelines. Prior approval shall also be taken from BRPL for the same. e. Tariff rate registers shall be as follow R1: Rate register for Peak R2: Rate register for Normal R3: Rate Register for Off Peak
7.6	Instantaneous Parameters	All the parameters mentioned in table '1' of IS 15959 (Part 3) along with following additional parameters shall be supported by meter. a. Neutral Current (I_N) b. % TDH in R phase Voltage c. % THD in Y Phase Voltage d. % THD in B Phase Voltage e. % THD in R phase Current f. % THD in Y Phase Current g. % THD in B Phase Current h. Displacement PF i. temperature j. RF/ GSM signal Strength in milli db. k. GPS Coordinates. Method of Measurement for harmonic parameters at sl no. 'b' to 'g' shall confirm to the IEEE 519, 2014.
7.6.1	Association Rights	As per Clause 1.1.1 of IS 15959 (Part 3).
7.7	Billing data	a. Billing parameters shall be generated at the end of each billing cycle and stored in memory as

		per provisions provided in clause no. 14 of IS 15959 (Part 3). b. 6 no's billing cycle parameters shall be remain in meter memory along with current cycle parameters and shall be available for reading as well as profile and or 'by entry' for selective access. c. All the parameters mentioned in table '4' of IS 15959 (Part 3) shall be supported by meter.
7.7.1	Association Rights	As per clause 14 of IS 15959 (Part 3).
7.7.2	Selective access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.7.3	Billing period reset/ MD reset	00:00 Hrs of Ist of every month
7.7.4	Billing period reset mechanism	As per clause 10 of IS 15959 (Part 1)
7.7.5	Billing period counter	Cumulative billing period counter since installation and available billing periods shall be provided as per clause 11.2 of IS 15959 (Part 1).
7.8	Load survey Data	a. Load survey parameters shall be measured and recorded at the end of each profile capture period for last 35 Power ON days. b. All the parameters mentioned in table '15' of IS 15959 (Part 3) along with following additional parameters shall be supported by meter: % THD in R phase Voltage % THD in Y Phase Voltage % THD in B Phase Voltage % THD in R phase Current % THD in Y Phase Current % THD in B Phase Current
7.8.1	Profile capture period	Default 1800 s programmable to 900 s.
7.8.2	Selective Access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.8.3`	Association Rights	As per clause no.18 of IS 15959 (Part 3)
7.9	Daily load profile	Daily load profile parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 35 Power ON days. All the parameters mentioned in table '3' of IS 15959 (Part 3) shall be supported by meter as Daily load

		profile parameters.
7.9.1	Association Rights	As per clause no. 13 of IS 15959 (Part 3)
7.10	General Purpose Parameters	Following parameters shall be provided in Non Volatile memory (NVM) of the meter as per clause 16 of IS 15959 (Part 3).
7.10.1	Name Plate Detail	As per Table '12' of IS 15959 (Part 3) with following additional parameters. a. Month of manufacturing.
7.10.2	Association Rights	As per clause no. 16.1 of IS 15959 (Part 3)
7.10.3	Programmable parameters	These 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. Programming of any of the parameters shall increment the 'Cumulative programmable count' value. All the parameters mentioned in table '13' of IS 15959 (Part 3) shall be supported by meters with following additional parameters.
7.10.4	Association rights	As per Clause no. 16.2 of IS 15959 (Part 3).
7.11	Push Services	a. Smart meter is able to automatically notify data, event, and messages to a destination client system in an unsolicited manner (without a request from a client) as per clause no 6 of IS 15959 (Part 2). b. Randomization: Data from different endpoints shall be pushed intelligently on the network in order to avoid excessive traffic on the network for example in case all the endpoints will push load survey data simultaneously, then it may result in network choking or inefficient performance. Therefore with the help of intelligent techniques such field scenarios shall be handled effectively. c. It shall also be possible to configure push services for all profiles i.e instantaneous, billing, load survey, daily energy and events. Bidder should explain its capability to configure push services. However following push services shall be available by default. i. Load survey profile data at after every 4

		hours configurable to any predefined interval. ii. Mid night data at 00:00 hrs of every day. iii. Billing profile data on occurrence of billing.
7.11.1	Periodic push (Smart meter to HES)	a. Meter shall be able to push instantaneous parameters to HES at predefined intervals. Parameters required for push shall be intimated during detailed engineering in the vent of order. b. Other attributes as per IS 15959 (Part 3) i.e. Send Destination, Communication window, Randomization time interval, number of retries and repeat delay shall be decided in the event of manufacturing.
7.11.2	Event Push (Smart meter to HES)	a. Meter is able to report HES, the status change of any of the identified events mapped in to event status word (ESW) of size 128 bits by pushing following objects to HES. i. Device ID ii. Push Setup ID iii. Real time clock- Date and Time iv. Event Status Word 1 (ESW 1). b. Each of the bits in ESW shall reflect the current state of the event and are mapped against each of the identified events. c. An event status word filter (ESWF) of 128 bit shall also be provided to configure events for event push. Events which are supported in meter shall only be configured for event push. Bit value 1 in ESWF shall indicate that the event is supported and value 0 indicates that event is not supported for event push. Position of the event bit in ESWF shall be same as in ESW.
7.11.3	Event status Bit mapping	As Per IS 15959 (Part 3)
7.12	Firmware upgrade	a. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. b. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3.

		c. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. d. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade. e. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory. f. Meter shall support capability to self register the meter with new firmware. g. The execution time of the change of the firmware within the meter should be below 1 minute
7.13	Support for broadcast message	Meter shall support connection less messaging services of DLMS to support broadcast messages for a group of meters for following actions: a. Gap reconciliations. b. Firmware upgrade. c. On demand readings d. Meter connection and disconnection. e. Updating of Programmable parameters
7.14	First breath and last gasp	a. In Last Gasp endpoint shall send the power outage notification with Time Stamp. In case of power failure meter communication module shall not draw power from the backup battery. b. For the purpose of sending the Last Gasp, communication module shall have proper power backup (like a super capacitor).
7.15	Security	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided.
7.151	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
7.15.2	Encryption/ Authentication for data transport	As per clause 7.2 of IS 15959 (Part 2)
7.15.3	Key requirement and handling	As per clause 7.3 of IS 15959 (Part 2)

7.15.4	NIC Security	a. Proper security at end points as well as network level shall be present to prevent unauthorized hacking of the end points or the network itself. b. The meter password is required to open a session between NIC and meter and is required to gain clearance from the meter to perform requested operation. c. If clearance not gains, the meter locks out communication for 1 minute. The meter maintain counter for monitoring of unsuccessful attempts of performing meter operations and alerts to HES. The counter is incremented each time a password clearance operation fails. d. Up to 3 no's successful attempts are allowed, after which the port is locked out until authenticated from system administrator.
7.16	IP communication profile support	Meter shall support TCP-UDP/ IP communication profile for smart meter to HES. Please refer clause 8 of IS 15959 (Part 3).
7.17	Consumer display unit (Optional)	Provision of consumer interface unit (CIU) to access meter from consumer premises. Wireless IHD powered by battery.
7.18	Event and tamper detection	Meter shall detect and log any exceptional/ fraud/ tamper conditions in its memory as an event. In addition to this all transactions and control shall also be recorded as an event in meter memory. Each event type shall be identified by an event ID.
7.18.1	Association Rights	Each event shall be available to download as per following association rights. a. Public Client: No access b. Meter Reader: Read only c. Utility Settings: Read only d. Push Services: Read Only for identified events as per ESWF
7.18.2	Compartments of events	Meter shall be able to log events in following compartments a. Voltage Related Events b. Current Related Events c. Power Related Events d. Others Events e. Non Roll Over Events

		f. Transaction related events g. Control Events
		a. Occurrence and Restoration of Voltage Related, current related, power related and other events shall be logged in meter memory as per IS 15959 (Part 3). Please refer annexure 'A' for description of events, Event ID, Logics of events and threshold values of events. b. Threshold values shall be factory programmable. c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1). d. For each of the events a certain list of parameters shall be captured as per clause 'a' e. For each occurrence event captured, the cumulative tamper count shall be incremented.
7.18.3	Parameter Snapshot	Meter shall capture all the parameters mentioned in table '24' of IS 15959 (part 3) when event occurrence and restoration is logged
7.18.4	Event Logging	The meter shall log minimum 100 tamper events (ensuring at least 20 events for each tamper).
7.18.5	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
7.19	Phasor Representation	Meter shall support parameters required to develop phasors of current and voltage at HES.

8. Meter Display

SN	Item	Description
8.1	LCD Type	STN Liquid crystal with backlit
8.2	Viewing angle	a. Minimum 120 Degree. 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.
8.3	Size of LCD	Minimum 10X5mm
8.4	LCD Digits	Total 6+1 digits
8.5	LCD language	English
8.6	Display modes	a. Auto Mode b. Manual Mode c. Sub active mode

		Display list shall be finalized during detailed engineering in the event of order.
8.7	Display indications	Appropriate indications/flags for all tampers and self diagnostic features should be provided.

9. Data and Communication Protocol/ HES/ Integrations/ Software

SN	Item	Description
9.1	Data Exchange protocol	a. Meter should comply Indian companion of data exchange and tariff control specification IS 15959 (Part 2). b. In case of additional requirement from IS 15959 (part 2), they shall be as per DLMS standards/ IEC DLMS protocols suite (62056). c. Bidder shall explain in detail the additional parameters/ services/ methods used in meters from IS 15959 (part 2) and its reference to DLMS books/ IEC. d. Prior to manufacturing of meters bidder shall provide a detailed specification explaining all parameters/ services/ methods used in meter in addition to IS 15959 (Part 3).
9.2	Integration with HES	a. Bidder shall work with BRPL IT team/ BRPL designated system integrator to integrate its meter with BRPL HES system. b. Bidder shall prepare detailed documents as mentioned in above clause and submit it for BRPL approval and integration with HES.
9.3	Base computer software	Licensed Software with the following features should be supplied for free to download meter through optical port.
9.3.1	Operating System	BCS should be compatible for latest Windows operating system.
9.3.2	Security	System shall be password protected where user can login only if login ID is provided by administrator. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
9.3.3	Database	BCS shall maintain master database according to desired area, location, and region etc.
9.3.4	Reporting	a. BCS shall have option of user defined report generation in format of Excel, Word and CSV, XML, PDF etc. b. BCS shall have capability to export data in ASCII, CSV and XML format at desired location so that the same could be integrated with our billing data for processing. c. All the data available in the meter shall be convertible to

		user defined ASCII, CSV and XML file format.
9.3.5	Data transfer rate	BCS and communication ports should support data transfer rate of 9600 bps (minimum).
9.4	Hand Held Unit Software	a. The manufacturer has to provide software capable of downloading all the data stored in meter memory through window/ android operating system based handheld units (HHU) through optical port. b. In the event of order, bidder shall work with BRPL IT team/ BRPL designated system integrator to develop HHU software for meter downloading and further uploading on HES. c. HHU software should have option for selection of parameters to be downloaded from meter. d. Meter data consisting of all parameters and complete load survey for all parameters shall be read by HHU and downloaded on HES in minimum possible time (not more than 5 minutes).
9.5	Training	Manufacture shall impart training to BRPL personnel for usage of software

10. Name Plate

SN	Description
10.1	Meter Serial number shall be of 8 digits. Serial number shall be printed in black colour. Embossing is not acceptable.
10.2	Size of the digit shall be minimum 5X3mm
10.3	Bar code shall be printed along with serial number
10.4	BIS registration mark (ISI mark)
10.5	'BRPL' insignia shall be printed above LCD display.
10.6	BRPL PO No. & date
10.7	Manufacturers name and country of origin
10.8	Model type / number of meter
10.9	Month and Year of manufacturing
10.10	Reference voltage / current rating
10.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
10.12	Meter constant
10.13	Class index of meter
10.14	Reference frequency

10.15	Warranty period
10.16	Name plate of NIC a. Serial no of NIC along/ IMEI no/MAC address with bar code b. Name of purchaser's c. Communication technology with carrier frequency d. Manufacturing year and month. e. Warranty period.

11. Component Specification

SN	Item	Description	Make
11.1	Current Transformers	The Meters should be with the current transformers as measuring elements.	To meet accuracy requirement
11.2	Measurement or 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, Atmel, Phillips, SAMES ,NEC,TEXAS
11.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Hitachi, Compiled
11.4	Display modules	a. The display modules should be well protected from the external UV radiations. b. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). c. It should be STN type industrial grade with extended temperature range min 70 ºC.	Hongkong: Genda Singapore: Bonafied technologies Korea: Advantek China: Success Japan: Hitachi, Sony
11.5	Optical port	The mechanical construction of the port should facilitate the data transfer. Communication shall not disturbed by external light.	USA: National Semiconductors, HP Holland/ Korea: Phillips Japan: Hitachi, Ligitek
11.6	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of	SMPS Type

		the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	
11.7	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments. Japan: Hitachi, Oki, AVX or Ricoh Korea: Samsung
		LED	Everlight, Agillent
11.8	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
11.9	Battery	Lithium with guaranteed life of 15 years	Texcell, SAFT, Varta, Tedirun, Sanyo
11.10	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip, TEXAS, Japan: NEC, Oki
11.11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)
11.12	Note	a. The components used by manufacturer shall have "Minimum Life" more than the 10 years. b. Incase vendor want to use other make components; same shall be approved by BRPL before use. c. Even for existing supplier – fresh approval is needed for all	

		deviations. d. Manufacturer should have complete tracking of material used in meter. BRPL reserve the right to carry out audit of inventory/ manufacturing process at manufacturer's works and sub vendor's work.	

12. Quality Assurance, Inspection and Testing

SN	Item	Description
12.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
12.2	Sampling Method	Sampling Method for quality checks shall be as per relevant IS/ IEC/ CBIP guidelines and Purchaser's prior approval shall be taken for the same.
12.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.
12.4	Type Tests	a. The meter shall be of type tested quality including all tests specified in this specification which are beyond IS / IEC or CBIP. b. Type test conducted from CPRI/ ERDA/ or any other lab specified by BIS/ CEA for smart meter testing will be treated as valid. c. Type test certificate should be submitted along with offer for scrutiny. d. Any other component supplied in addition to meter shall also be type tested as per IS /IEC if applicable. e. Complete type test as per IS 16444 (Part 2) shall be carried out on sample selected from BRPL lot.
12.5	Routine tests	All test marked "R" as per table 20 of IS 14697.
12.6	Acceptance Tests	a. All tests marked "A" as per IS 14697. b. Smart meter functional tests as per IS 16444 (Part 2). c. Test for data exchange protocol as per IS 16444 (part 2). d. Test for Smart meter communicability as per clause no. 10.6 of IS 16444 (Part 2). e. All the routine and acceptance tests shall be carried out as per relevant standards. f. Following tests in addition to IS shall be conducted during lot inspection.

		I) Dimensional and drawing verification. II) Display parameters/ sequence. III) Data Downloading from CMRI and PC. IV) Tamper/ fraud detection/logging features as per approved documents. Tamper conditions will be simulated at varying load up to Imax. Accuracy will also be checked during tamper simulation. V) Burn in chamber test. VI) Component verifications. g. Purchaser reserves the right to formulate any other test method to verify guaranteed parameters of Meter.
12.7	ESD and Magnetic Interference test	ESD and magnetic interference test will be conducted at Samir lab, Chennai or CPRI.
12.8	Inspection	a. Purchaser reserves the right to inspect /witness all tests on the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards. b. Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per clause 14.3 relevant standards and tampers logics as per approved GTP. All the equipments including tamper logs kits/ jigs should be calibrated. c. In-process and / or final inspection call intimation shall be given in advance to purchaser.

13. Packing, Marking, Shipping, Handling and Storage

13.1	Packing	a. Each meter must be packed, together with its terminal cover, in a separate environmental friendly cardboard box, which can be opened and re-closed without needing adhesives. b. Up to 4 to 5 three-phase meters must be packed together with their terminal covers in a group cardboard box, which can be opened and re-closed without needing adhesives. c. The box shall prevent, as much as possible, penetration of dust during long storage periods. The box must be designed for multiple use and be robust, with wall thickness of at least 4 mm. d. Maximum weight of a group meter box shall not be more than 25 Kg. e. The packaging will protect the meters against shock and

		vibration, preventing damage due to the road conditions during transport and distribution in the field. The electrical and mechanical properties shall not be affected by these disturbances. f. For shipping the boxed meters will be close packed by stockpiles of suitable quantities on pallets. The meters numbers sequence (without partition) shall be kept in each pallet. A pallet will be protected against moisture by a polyethylene hood, covered with a cardboard cover (hood), and fixed onto the pallet by parallel polypropylene bands, using protection angle bars at the corners. The hood shall be marked – on the front (wide side), on the narrow side and on the top as per clause 13.3. g. Each pallet should contain between 70 and 300 meters. The actual number of meters on each pallet will be agreed with the BRPL in the event of order. h. An impact detector ("Shock-Watch") label shall be attached to the cardboard hood of several pallets in each container/ transport truck, to warn of possible rough handling during shipment, transport and storage.
13.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label.
13.3	Marking	On each group box and pallet, following details are required both on front (wide side) and top: a. BRPL logo. b. Meter serial number range along with bar code. c. Unique number of box/ pallet. d. Purchaser's name e. PO number (along with SAP item code, if any) & date with bar code f. Equipment Tag no. (if any) g. Destination h. Manufacturer / Supplier's name i. Address of Manufacturer / Supplier / it's agent j. Type , rating and other description of equipment k. Country of origin l. Month & year of Manufacturing m. Case measurements n. Gross and net weights in kilograms

		o. All necessary slinging and stacking instructions
13.4	Test reports	Routine test report to be provided with each meter
13.5	Shipping	The seller shall be responsible for all transit damage due to improper packing.
13.6	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet /manual to be furnished before commencement of supply.

14. Deviations

14.1	Deviations	a. Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. b. In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.

15. Drawing Submission

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

SL	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Tamper Sheet	Required	Required	
4	Display Parameters	Required	Required	
5	GA / cross sectional drawing of Meter showing all the views / sections	Required	Required	
6	Detail of network interface i.e. pin out, standard, voltage level etc and its integration requirement.	Required	Required	
7	Samples of each type and rating offered along with box (Highest rating offered) and RF NIC/ communication module of already integrated RF card as per tender qualifying criteria.	2 no's	1 no's	
8	Any software and accessories required for installation/ operation of meter	Required	Required	
9	Manufacturer's quality assurance plan and	Required		

	certification for quality standards			
10	Type Test reports of offered model/ type/ rating	Required		
11	BIS certificate	Required		
12	Complete product catalogue and user manual.	Required		
13	Customer Reference List	Required		
14	Recommended list of spare and accessories	Required		
15	Specification documents containing all parameters, Services, Methods in addition to companion specification of IS 15959 (part 2).		Required	
16	Program for production and testing (A)		Required	Required
17	Makes of components		Required	Required
18	Detailed installation and commissioning instructions		Required	Required
19	As Built Drawing		Required	Required
20	Operation and maintenance Instruction as well as trouble shooting charts/ manuals		Required	Required
21	Inspection and test reports, carried out in manufacturer's works			Required
22	Routine Test certificates			Required
23	Test certificates of all bought out items			Required
24	Meter Seal data			Required
25	Mapping of meter serial no to Communication card.			Required

16. Delivery

16.1	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.

Annexure – A: Guaranteed Technical Particulars

Bidder shall furnish the GTP format with all details against each clause of this specification.
Bidder shall not change the format of GTP or clause description.
Bidder to submit duly filled GTP in hard copy format with company seal.

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

Bidder / Vendor seal / signature ----------

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number and email id	

Annexure – B: Recommended Accessories / Spares

SL	Description of spare part	Unit	Quantity
1		No	
2		No	
3			

Annexure – C: Integration Requirement of Meters with NIC and HES

Integration requirements with communication provider of BRPL/ any other agency designated by BRPL for other components of AMI.

a. Bidder(s) must share the meter security keys, all level encryption, and password information along with asset information in a format with the buyer / communication provider of BRPL so that during AMI business flow, the device and data can be authenticated all the time.
b. Bidder(s) must share the details of meter communication specifically programmed protocols.
c. Bidder(s) must share the meter configuration source code to the BRPL/ communication provider of BRPL.
d. Bidder (s) must share the meter interface touch points for external applications/ systems.
e. Bidder(s) must share the required APIs including but not limited to reading APIs, configuration APIs and Functional APIs with the System Integrator for execution of business flow (Installation, reading, configuration).
f. Bidder(s) must share the data storage and retrieval details.
g. Bidder(s) must configure the devices to be upgraded remotely (OTA) and share the required firmware source code (with updates over the project life) with system integrator as and when it is required in case of feature request or fault correction.
h. Bidder(s) must follow and conduct Utility's sample and periodic test program, including (but not limited to) the selection of a sample population of meters, sharing of sample test results as reported by the meter testing systems with the system Integrator.
i. Bidder(s) must share the information related to communication module for the authorization purpose at to BRPL/ communication provider of BRPL.

Annexure – D: Tamper and Fraud Detection/ Events

1. Voltage Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
R Phase Voltage Missing (Occurrence/ Restoration)	Absence of potential on any phase should be logged. Restoration of normal supply shall also be recorded. The threshold value of voltage should be programmable at factory end	Occurrence: If Vpn<10% Vref and Ip>10% Ib Restoration: If Vpn>=10% Vref and Ip>10% Ib	Occurrence: 5 Min Restoration: 5 Min
Y Phase Voltage Missing (Occurrence/ Restoration)			
B Phase Voltage Missing (Occurrence/ Restoration)			
Over Voltage (occurrence/ restoration)	Meter should log high voltage event if voltage in any phase is above a threshold value.	Occurrence: If Vpn>10% Vref Restoration: If Vpn<=10% Vref	Occurrence: 5 Min Restoration: 5 Min
Low Voltage (occurrence/ Restoration)	Meter should log low voltage event if voltage in any phase is below a threshold value. Threshold value if factory programmable.	Occurrence: If Vpn<75% Vref Restoration: If Vpn<=75% Vref	Occurrence: 5 Min Restoration: 5 Min
Voltage Unbalance (Occurrence/ Restoration)	Meter should log voltage imbalance event when the difference between minimum and maximum phase voltage is more than a threshold value. Threshold value should be factory programmable.	Occurrence: If Vmax-Vmin>30% Vref Restoration: If Vmax-Vmin<=30% Vref	Occurrence: 5 Min Restoration: 5 Min
R Phase high Voltage Harmonics	Meter should log occurrence of high voltage harmonic event when % THD in voltage of phase will be more than threshold value. Threshold value should be factory programmable.	Occurrence: If % THD in Vpn>5% of fundamental. Restoration: If % THD in Vpn<5% of fundamental.	Occurrence: 5 Min Restoration: 5 Min
Y Phase high Voltage Harmonics			
B Phase high Voltage Harmonics			
2. Current Related Events:			

Description of event	Logic Of Event	Logic Expression/ Threshold values	Persistence Time
Current Reverse/ R Phase Current Reverse (occurrence/ Restoration)	Meter should log the event of reversal of C.C polarity. Meter should register energy consumed correctly with any one, two or all three current coils reversed. This event shall not be valid in bidirectional mode of metering.	Occurrence: If Ip = -ve direction Restoration: If Ip=+ve direction	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Reverse (occurrence/ Restoration)			
B Phase Current Reverse (occurrence/ Restoration)			
R Phase Current Open (Occurrence/ Restoration)	Meter should log the event of current coil open. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)*>20% Ib and I<10% Ib* *Vector Sum($I_R+I_Y+I_B+I_N$)>20% Ib*	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Open (Occurrence/ Restoration)			
B Phase Current Open (Occurrence/ Restoration)			
Current Unbalance (Occurrence/ Restoration)			
Current Bypass (Occurrence/ Restoration	Meter should log the event of current coil shorting/bypass. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)*>20% Ib and I (any Phase) >5% Ib* *Vector Sum($I_R+I_Y+I_B+I_N$)>10% Ib*	
Over current (occurrence/ restoration)	If the current in any phase exceeds the specified threshold current, meter should log over current event.	Occurrence: If Ip>Imax Restoration: If Ip<=Imax	Occurrence: 5 Min Restoration: 5 Min

R Phase high Current Harmonics R Phase high Current Harmonics R Phase high Current Harmonics	Meter should log occurrence of high voltage harmonic event when % THD in voltage of phase will be more than threshold value. Threshold value should be factory	Occurrence: If % THD in I_P>5% of fundamental. Restoration: If % THD in I_P <5% of fundamental.	Occurrence: 5 Min Restoration: 5 Min
3. Power Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Power OFF (occurrence/ restoration)	Meter shall detect power OFF if all phase voltages are absent. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded.		
Abnormal Power Off (Occurrence/ restoration)	If meter micro detect power off whereas phase voltage is present than abnormal power will be recorded. Meter sall continue to record energy as per phase voltage and current.	Occurrence: If voltages at meter power supply<10% Vref and Vp>20% vref. Restoration:	NA
4. Other Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Abnormal External Magnetic Influence (Occurrence/ Restoration)	a. Meter should either be immune or should log the events of attempt of tampering by external magnetic field as per relevant IS14697/ CBIP 325 with latest amendments. b. If the working of meter gets affected under the influence of external magnetic field, meter should record energy at Imax. Meter should not compute MD during this period. The	As per IS 14697/ CBIP 325	As per IS 14697

	meter shall record energy as per actual load once the magnetic field is removed.		
Neutral Disturbance- HF, DC and Alternating (occurrence/ restoration)	Meter should log the event when AC/DC/ Pulsating voltage is injected in neutral circuit.	As per manufacturing standard.	Bidder shall define threshold values
Low Power Factor	Meter shall able to detect and log the low PF event if power factor of the load found in between 0.2 to 0.5 for a load above than a % threshold value for a threshold time value. Event shall restore if PF factor of load remain out of range 0.2 to 0.5 for a load above than % threshold value for		10% of I basic
Plug in Communication module removal (Occurrence/ Restoration)	Meter should log the removal of communication card. Meter should also log insertion of communication card.	By NC switch/ sensor	
Configuration change to post-paid mode/ pre-paid mode	Meter should log the change in payment mode configuration.		
Configuration change to “Forwarded” only" mode/ “Import and Export” mode	Meter should log the change in metering mode configuration.		
Overload (Occurrence/ Restoration)	Meter should able to log the status of overload in KW		
HV Spark (Occurrence/ restoration)/	Meter with communication card should be immune or log the event in the case of application	Immediately	NA

Jammer	of ESD upto and including 35 KV.		
High neutral Current	Meter should log event of high neutral current if measured neutral current should be more than predefined threshold value.	Occurrence: If I_N > 50% of average phase current Restoration: If I_N < 50% of average phase current	Occurrence: 5 Min Restoration: 5 Min
Distorted PF	Meter shall log the event if difference between displacement PF and actual PF is more than a predefined value		Occurrence: 5 Min Restoration: 5 Min
Time Based Event Stamp	Meter shall log voltage, current, PF and energy consumption on a predefined time	As per predefined time	NA

5. Non Roll over events:
Event Description
Occurrence of cover open
6. Transaction Related Events:
Detail of Transaction
Real Time Clock- Date and Time
Demand Integration Period
Profile Capture Period
Single Action schedule for billing date
Activity calendar for time zones
New firmware activated
Load Limit (Kw) Set
Enable Load Limit Function
Disable load limit function
LLS secret (MR) change
HLS key (US) change
HLS key (FW) change
Global key change
ESWF change
MD reset

Note:

1. Event ID's shall be defined as per BRPL specification/ IS 155959 (part 2). Approval shall be taken from BRPL prior to manufacturing for Event ID's
2. Programming of threshold values should be possible from remote via proper authentications.
3. Logics of tampers can be changed/ upgraded via firmware up gradation from remote via proper authentication.

4. All the programming changes/ firmware up gradations shall be logged along-with date and time stamp in meter as well as on HES.

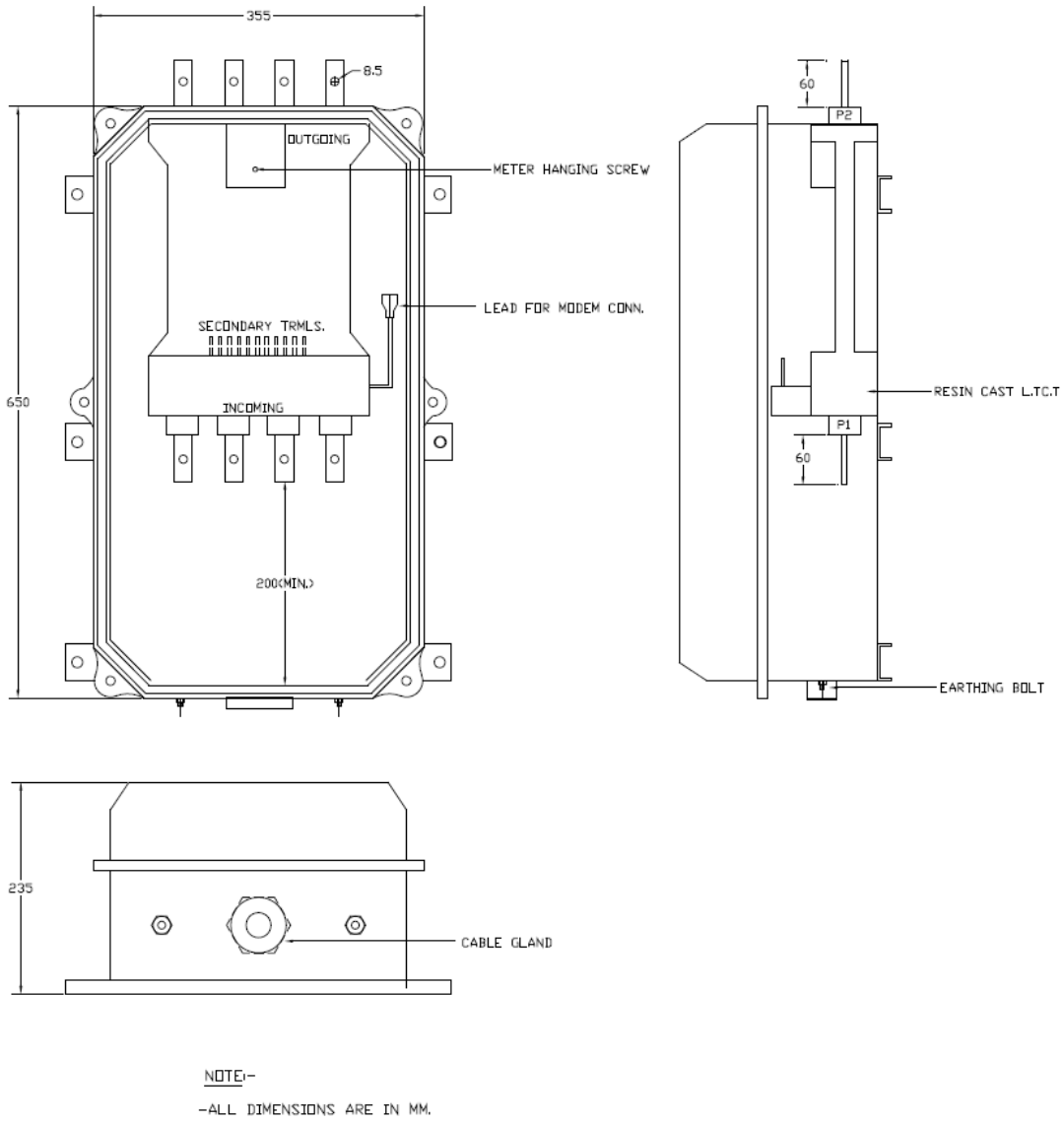
Annexure – E: Technical Specification of LTCT Box

1.0 GUARANTEED TECHNICAL PARTICULARS FOR LTCT BOX

S No.	Parameters	Requirement	Data by Supplier
1	Manufacturer name		
2	Nominal/Highest system voltage	415V/660V	
3	Box details		
3.1	Material	Polycarbonate	
3.2	Base	Opaque, dark grey	
3.3	Top cover	Transparent	
3.4	Overall dimensions	As per Annexure - C	
3.5	Marking of terminations	To be provided	
3.6	Suitable Arrangement for modem installation	To be provided	
3.7	Rating Plate	Two nos. (one each on box and CT block)	
3.8	Connection diagram	To be provided on rating plate mounted on CT block	
3.9	Protection Class	IP55	
3.10	Sealing arrangement	To be provided on all corners	
3.11	Nuts & Bolts	For I/C & O/G connections	
3.12	Mounting channel	MS (HDG)	
3.13	Fasteners for Installation	4 nos.	
3.14	Gland Plate	200 x 100mm, MS (HDG)	
3.15	Cable Gland	To be provided	
4	CT Details		
4.1	Reference standard	IS 2705	
4.2	Type of CT	Resin cast	
4.3	Class of accuracy	0.5	
4.4	ISF	<=10	
4.5	Burden	5 VA	
4.6	Transformation Ratio	400/5 A /200/5 A/100/5 A as per purchaser’s requisition	
4.7	Frequency	50 Hz	
4.8	Insulation level	660V / 3KV	
4.9	Insulation class	E	
4.10	Short time current rating for 1 sec.	20 times the rated current	
4.11	Primary winding type	Bar	
4.11.1	Material of conductor	Aluminium	
4.11.2	Size of conductor	1A/Sqmm	
4.12	Secondary winding	Wound	

4.12.1	Material of conductor	Copper	
4.12.2	Size of conductor		

2.0 LTCT Box layout and CT Detail



NOTE:-

-ALL DIMENSIONS ARE IN MM.

Technical Specification for HT-CT Smart Meter

Document number: BR/18-19/SM/HT/01

June 2018

Prepared By	Reviewed by	Approved By
Md. Akhtar Ansari 5.6.18	05/06/18	05/06/18.
Md. Akhtar Ansari	**Rishi Goyal**	**Sheshadri Krishnapura**

Index

Record of Revision

Item/Clause No.	Change in Specification	Reason of Change	Approved By	Rev

1. Scope of Supply

This specification covers the following for Three Phase 63.5 V, AC Static transformer operated Watt hour and Var Hour smart meters of accuracy class 0.5s/ 0.2s with plug in communication module (RF mesh only and RF + Cellular technology).

A. Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.

B. Any accessories / hardware required for installation and operation for the meter.

2. Codes and Standards

Materials, equipment and methods used in the manufacturing of above mentioned equipment shall conform to the latest edition/ of following

S No.	Standard Number	Title
2.1	Indian Electricity Act	IE Act 2003
2.2	CEA Metering Regulations	With latest amendments
2.3	CBIP Manual (Pub no.-325)	Standardization of AC Static Electrical Energy Meters
2.4	IS- 16444 (Part 2)	AC Static Transformer Operated Watt-hour And Var-hour Smart Meters, Class 0.2 S, 0.5 S And 1.0 S Part 2 Specification Transformer Operated Smart Meters
2.5	IS- 14697	ac Static Transformer Operated Watt-hour and Var-hour Meters, Class 0.2 S and 0.5 S
2.6	IS-15959 (Part 1)	Data Exchange for Electricity Meter - Reading Tariff and Load Control - Companion Specification
2.7	IS-15959 (Part 2)	Data Exchange for Electricity Meter - Reading Tariff and Load Control (Part 2)- Companion Specification for smart meter
2.8	IS-15959 (Part 2)	Data Exchange For Electricity Meter Reading, Tariff And Load Control- Companion Specification Part 3 Smart Meter (Transformer Operated Kwh And KVARh Class 0.2 S, 0.5 S And 1.0 S
2.9	IS- 11448	Application guide for AC Electricity meters
2.10	IEC- 62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
2.11	IEC- 62053-21	Electricity metering equipment (A.C) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
2.12	IEC- 62053-52	Electricity metering equipment (AC) - Particular requirements - Part 52: Symbols
2.13	IEC 62053-61	Electricity metering equipment (A.C.) - Particular requirements - Part 61: Power consumption and voltage requirements

2.14	IEC 62058-11	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
2.15	IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
2.16	IEC 60736	Testing Equipment for electrical Energy meter
2.17	IS/IEC/TR 62051:Part 1:2004	Electricity Metering — Data Exchange For Meter Reading, Tariff And Load control — Glossary Of Terms Part 1 Terms Related To Data Exchange With metering Equipment Using DLMS/ COSEM
2.18	IEC 62056-1-0:2014	Smart metering standardisation framework
2.19	IEC 62056-3-1:2013	Use of local area networks on twisted pair with carrier signalling
2.20	IEC 62056-4-7:2014	DLMS/COSEM transport layer for IP networks
2.21	IEC 62056-5-3:2017	DLMS/COSEM application layer
2.22	IEC 62056-6-1:2017	Object Identification System (OBIS)
2.23	IEC 62056-6-2:2017	COSEM interface classes
2.24	IEC 62056-6-9:2016	Mapping between the Common Information Model message profiles (IEC 61968-9) and DLMS/COSEM (IEC 62056) data models and protocols
2.25	IEC 62056-7-3:2017	Wired and wireless M-Bus communication profiles for local and neighbourhood networks
2.26	IEC 62056-7-5:2016	Local data transmission profiles for Local Networks (LN)
2.27	IEC 62056-7-6:2013	The 3-layer, connection-oriented HDLC based communication profile
2.28	IEC TS 62056-8-20:2016	Mesh communication profile for neighbourhood networks
2.29	IEC TS 62056-9-1:2016	Communication profile using web-services to access a DLMS/COSEM server via a COSEM Access Service (CAS)
2.30	IEC 62056-9-7:2013	Communication profile for TCP-UDP/IP networks
2.31	IEC 62056-21:2002	Direct local data exchange
2.32	DLMS- White Book	Glossary of DLMS/COSEM terms
2.33	DLMS- Blue	COSEM meter object model and the object identification system

	Book	
2.34	DLMS- Green Book	Architecture and protocols to transport the model
2.35	DLMS- Yellow Book	Conformance testing process
2.36	IEEE 802.15.4	Standard for Local and metropolitan area networks.
2.37	IEEE 802.15.4u	Standard for Local and metropolitan area networks (Use of the 865 MHz to 867 MHz Band in India)
Order of precedence between different standards shall be as follow:		
i	Indian Standards Issued By BIS	
ii	IEC standard	
iii	Other standards like CBIP, DLMS etc.	

3. Service Conditions

SN	Item	Description
3.1	Temperature Range	Operation range: -10 Deg C to 55 Deg C Limit range of operation: -25 to 60 Deg C Limit range of storage / transport : -25 to 70 Deg C
3.2	Relative Humidity	0 to 96 %

4. Distribution System Data

SN	Item	Description
4.1	Supply	3 Phase AC, 4 wire
4.2	Voltage	415 V ± 6%
4.3	Frequency	50 Hz ± 5%
4.4	System Neutral	Solidly Earthed

5. Electrical and Accuracy Requirement

SN	Item	Description
5.1	Meter Type	3- ø, 4 wire static Transformer Operated Smart Meter
5.2	Connection	Transformer Operated
5.3	Rated Voltage	63.5 V (phase to neutral) with variation of +30% & -40%. However meter should withstand the maximum system voltage.
5.4	Rated Current	a. Ib -5A and Imax- 10 A b. Ib- 1A and Imax- 2 A as per purchaser's requisition/ BOQ

5.5	Starting current	0.1 % of base current
5.6	Rated Frequency	50Hz +/- 5%
5.7	Accuracy Class	0.5s/ 0.2s as per purchaser's requisition (IS14697 applies for accuracy requirements)
5.8	Power Consumption	As per IS 16444 (Part 2)
5.9	Meter constant	Imp/ unit (Bidder to specify meter constant)
5.10	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.11	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.12	Influence of supply voltage	As per IS 14697
5.13	Short time over current	As per IS 14697
5.14	Immunity to phase and earth fault	As per IS 14697
5.15	Influence of Self Heating	As per IS 14697
5.16	Influence of Heating	As per IS 14697
5.17	Electromagnetic compatibility	a. Meter shall remain immune to electrostatic discharge (upto and including 35KV), electromagnetic HF field and fast transient burst. b. The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not influence the meter. c. Meter shall be type tested for electromagnetic compatibility. d. Meter shall comply requirement of IS 14697

5.18	Limits of error due to influence quantities	Meter shall work within guaranteed accuracy as per IS 14697/ IEC62053-21/ CBIP325 (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: BRPL reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.

6. Construction Feature

SN	Item	Description
6.1	General	Construction should be in accordance with IS 16444 (Part 2)
6.2	Base Body	Material - Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level.
6.3	Top Cover	a. Material: Transparent/Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level. b. Top cover and base should be Ultrasonically/Chemically

		welded.
6.4	Terminal Block	a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent. b. Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135C and pressure of 1.8MPa. The terminals shall be designed so as to ensure adequate and durable contact such that there is no risk of loosening or undue heating.
6.5	Terminal cover	a. Material - UV stabilized transparent/Opaque polycarbonate cover b. Provision of sealing at two points through sealing screw. c. The sealing screws shall be held captive in the terminal cover. d. The terminal cover shall be extended type 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. Terminal cover should have provision for cable entry from bottom. e. Diagram of external connections should be embossed on terminal cover. Sticker is not acceptable. f. Mechanism shall be provided to record an event with occurrence and restoration in case of terminal cover is opened.
6.6	Terminals	a. Terminals shall be suitable for 6 Sqmm copper wire. b. Two no's flat head screws per terminal shall be provided c. Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % Imax. d. Terminals shall be clearly marked for phase / neutral / outgoing etc. e. Clearances and creep age shall be as per IS 14697.
6.7	Ingress Protection	IP 55 or better, but without suction in the meter.
6.8	Output device	Meter should 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.

6.9	RTC	a. The meter shall have internal real time crystal clock to set date and time. b. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. c. HES will sync RTC at least once a day.
6.10	Battery	Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Lithium thioyl Chloride battery will be preferred. In case battery removal or total discharge same should not affect the working & memory of the meter.
6.11	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power.
6.12	Self Diagnostic feature	Meter shall have self diagnostic for the following a. Date and RTC. b. Battery. c. Non volatile memory. d. Display e. Communication Card Status
6.13	Optical port	Meter shall have an optical port with a metal ring to hold magnet of probe. Optical port shall comply with hardware specifications provided in IEC-62056-21.
6.14	Communication Module Interface	a. Meter should have the provision for 01 no's plug in communication module for connectivity. The same interface shall be compatible with both Cellular and RF communication technologies interchangeable according to the site. b. Interface shall support data transfer between meter and network interface card over UART/ RS232. c. Meter shall have mechanism to log communication module removal as an event in its memory with date and time stamp. d. Meter Vendor shall work with BRPL designated RF provider to integrate their module in their meter. e. Preferred location of communication card module shall be on top of meter

6.14.1	Communication modules	a. Smart meter shall have 01 no's plug-in type communication modules/ Network Interface card (NIC) for connectivity of meter to HES from following options as per tender requirement: i. Communication Module/ NIC Type 1: RF based suitable for communication Network of BRPL designated RF canopy provider. ii. Communication Module/ NIC Type 2: RF and Cellular communication module (LTE 4G with 3G and 2G fall back as per Indian Telecom Standards). b. Meter shall have separate indications on display/ for remote and local communication. c. Communication module shall held in a casing which can be directly plugged in the meter. Sealing screw shall be provided.
6.15	Last Gasp	Meter shall have provisions to provide last gasp signals through communication module in case of power failure. Bidder should explain in detail the provisions provided in meter to achieve the requirement.
6.16	Meter Sealing Arrangement	a. Sealing should be in accordance with IS and CEA metering regulations with latest amendments. b. Sealing arrangement shall be such that sealed parts shall not be opened without breaking the seal or sealed part itself. There should be clear evidence of the breaking in case sealed parts shall be opened without breaking the seal. c. Approval shall be taken from purchaser for location of seals and number of seals.
6.16.1	Manufacturer's Seals	a. One Polycarbonate seal to be provided on meter cover. b. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram).
6.16.2	BRPL Seals	a. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram). Meter sides should not have sharp edges to avoid damage to hologram seals. b. Minimum one Polycarbonate seal should be provided

		on top cover. c. Seals will be issued to manufacturer free of cost. d. 02 no's polycarbonate seals shall be provided for communication module.
6.16.3	Seal record	Record of all seals shall be forwarded to purchaser with each lot.
6.17	Name Plate and marking	a. Meter should have clearly visible, indelible and distinctly marked name plate in accordance with IS 16444 (Part 2) & clause no. 10.0 of this specification. b. All markings and details shall be printed by laser only. c. Paper stickers are not allowed for name plate.
6.18	Resistance against heat and fire	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 14697.
6.19	Guarantee/ Warranty	a. 7.5 years from the date of dispatch or 7 year from date of commissioning, whichever is earlier b. Manufacturer shall undertake a guarantee to replace meter up to a period of 7 Year from the date of supply. The meters which are found defective/inoperative within the guarantee period shall be replaced as per meter service level agreement.

7. Functional Requirement

SN	Item	Description
7.1	Meter category	Smart meter comply with D3 category of IS 15959 (Part 3).
7.2	Mode of metering	a. It should be possible to configure meters in following modes of metering: i. Forwarded Only: In this mode any export active energy shall be treated as import energy and shall be recorded in forward only register. Apparent energy calculation in this mode shall be as per clause no. 7.4. ii. Bidirectional: Both Import and export energy recording shall be applicable in this mode of metering and relevant registers shall be updated. b. Any change in metering mode shall be logged in

		events with date and time stamp. c. Default mode of metering shall be forwarded only until specified otherwise.
7.3	KVAH Calculation	Lag only: KVAh is computed based on KVArh and KWH value. If PF=1, or leading, then KVAh = KWH. At no instance KVAh < KWh.
7.4	MD calculation	Block / sliding window with default demand integration period of 1800 s configurable to 900 s as per requirement. Meter should be configurable for block/ sliding window at the time of manufacturing. This change should not be possible in the field. Extended register shall be used for MD recording.
7.5	TOU Metering	a. Meter shall be capable of doing TOD metering in minimum 4 tariff rate registers programmable for minimum 8 time zones and 4 seasonal profiles. b. TOU metering shall be implemented by the activity colander method of IS 15959 Part 1 clause 9/ DLMS UA-1000-1 c. Special Day table shall be defined as per IEC/ DLMS UA-1000-1 d. Default TOU programming shall be as per latest DERC guidelines. Prior approval shall also be taken from BRPL for the same. e. Tariff rate registers shall be as follow R1: Rate register for Peak R2: Rate register for Normal R3: Rate Register for Off Peak
7.6	Instantaneous Parameters	a. All the parameters mentioned in table '1' of IS 15959 (Part 3) along with following additional parameters shall be supported by meter. i. Neutral Current (I_N) ii. % TDH in R phase Voltage iii. % THD in Y Phase Voltage iv. % THD in B Phase Voltage v. % THD in R phase Current vi. % THD in Y Phase Current vii. % THD in B Phase Current viii. Displacement PF ix. RF/ GSM signal Strength in milli db. x. GPS coordinates.

		b. Method of Measurement for harmonic parameters at sl no. 'ii' to 'vii' shall confirm to the IEEE 519, 2014.
7.6.1	Association Rights	As per Clause 1.1.1 of IS 15959 (Part 3).
7.7	Billing data	a. Billing parameters shall be generated at the end of each billing cycle and stored in memory as per provisions provided in clause no. 14 of IS 15959 (Part 3). b. 6 no's billing cycle parameters shall be remain in meter memory along with current cycle parameters and shall be available for reading as well as profile and or 'by entry' for selective access. c. All the parameters mentioned in table '4' of IS 15959 (Part 3) shall be supported by meter.
7.7.1	Association Rights	As per clause 14 of IS 15959 (Part 3).
7.7.2	Selective access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.7.3	Billing period reset/ MD reset	00:00 Hrs of Ist of every month
7.7.4	Billing period reset mechanism	As per clause 10 of IS 15959 (Part 1)
7.7.5	Billing period counter	Cumulative billing period counter since installation and available billing periods shall be provided as per clause 11.2 of IS 15959 (Part 1).
7.8	Load survey Data	a. Load survey parameters shall be measured and recorded at the end of each profile capture period for last 35 Power ON days. b. All the parameters mentioned in table '15' of IS 15959 (Part 3) along with following additional parameters shall be supported by meter: i. % THD in R phase Voltage ii. % THD in Y Phase Voltage iii. % THD in B Phase Voltage iv. % THD in R phase Current v. % THD in Y Phase Current vi. % THD in B Phase Current vii. Displacement PF
7.8.1	Profile capture period	Default 1800 s programmable to 900 s.
7.8.2	Selective Access	Support for selective access shall be provided for

		billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.8.3`	Association Rights	As per clause no.18 of IS 15959 (Part 3)
7.9	Daily load profile	a. Daily load profile parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 35 power ON days. b. All the parameters mentioned in table '3' of IS 15959 (Part 3) shall be supported by meter as Daily load profile parameters.
7.9.1	Association Rights	As per clause no. 13 of IS 15959 (Part 3)
7.10	General Purpose Parameters	Following parameters shall be provided in Non Volatile memory (NVM) of the meter as per clause 16 of IS 15959 (Part 3).
7.10.1	Name Plate Detail	As per Table '12' of IS 15959 (Part 3) with following additional parameters. i. Month of manufacturing.
7.10.2	Association Rights	As per clause no. 16.1 of IS 15959 (Part 3)
7.10.3	Programmable parameters	a. These 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. b. Programming of any of the parameters shall increment the 'Cumulative programmable count' value. c. All the parameters mentioned in table '13' of IS 15959 (Part 3) shall be supported by meters with following additional parameters: i. GPS coordinates.
7.10.4	Association rights	As per Clause no. 16.2 of IS 15959 (Part 3).

7.11	Push Services	a. Smart meter is able to automatically notify data, event, and messages to a destination client system in an unsolicited manner (without a request from a client) as per clause no 6 of IS 15959 (Part 3). b. Randomization: Data from different endpoints shall be pushed intelligently on the network in order to avoid excessive traffic on the network for example in case all the endpoints will push load survey data simultaneously, then it may result in network choking or inefficient performance. Therefore with the help of intelligent techniques such field scenarios shall be handled effectively. c. It shall also be possible to configure push services for all profiles i.e. instantaneous, billing, load survey, daily energy and events. Bidder should explain its capability to configure push services. However following push services shall be available by default. i. Load survey profile data at after every 4 hours configurable to any predefined interval. ii. Mid night data at 00:00 hrs of every day. iii. Billing profile data on occurrence of billing.
7.11.1	Periodic push (Smart meter to HES)	a. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. b. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3. c. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. d. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade. e. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it

		as an event in its memory. f. Meter shall support capability to self register the meter with new firmware. g. The execution time of the change of the firmware within the meter should be below 1 minute.
7.11.2	Event Push (Smart meter to HES)	a. Meter is able to report HES, the status change of any of the identified events mapped in to event status word (ESW) of size 128 bits by pushing following objects to HES. i. Device ID ii. Push Setup ID iii. Real time clock- Date and Time iv. Event Status Word 1 (ESW 1). b. Each of the bits in ESW shall reflect the current state of the event and are mapped against each of the identified events. c. An event status word filter (ESWF) of 128 bit shall also be provided to configure events for event push. Events which are supported in meter shall only be configured for event push. Bit value 1 in ESWF shall indicate that the event is supported and value 0 indicates that event is not supported for event push. Position of the event bit in ESWF shall be same as in ESW.
7.11.3	Event status Bit mapping	As per IS 15959 (part 3)
7.12	Firmware upgrade	a. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. b. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3. c. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. d. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade.

		e. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory. f. Meter shall support capability to self register the meter with new firmware. g. The execution time of the change of the firmware within the meter should be below 1 minute
7.13	Support for broadcast message	Meter shall support connection less messaging services of DLMS to support broadcast messages for a group of meters for following actions: a. Gap reconciliations. b. Firmware upgrade. c. On demand readings. d. Meter connection and disconnection. e. Updating of Programmable parameters.
7.14	First breath and last gasp	a. In Last Gasp endpoint shall send the power outage notification with Time Stamp. In case of power failure meter communication module shall not draw power from the backup battery. b. For the purpose of sending the Last Gasp, communication module shall have proper power backup (like a super capacitor).
7.15	Security	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided.
7.151	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
7.15.2	Encryption/ Authentication for data transport	As per clause 7.2 of IS 15959 (Part 2)
7.15.3	Key requirement and handling	As per clause 7.3 of IS 15959 (Part 2)
7.15.4	NIC Security	a. Proper security at end points as well as network level shall be present to prevent unauthorized hacking of the end points or the network itself. b. The meter password is required to open a session between NIC and meter and is required to gain clearance from the meter to perform requested operation. c. If clearance not gains, the meter locks out communication for 1 minute. The meter maintain counter for monitoring of unsuccessful attempts of performing meter operations and

		alerts to HES. The counter is incremented each time a password clearance operation fails. d. Up to 3 no's successful attempts are allowed, after which the port is locked out until authenticated from system administrator.
7.16	IP communication profile support	Meter shall support TCP-UDP/ IP communication profile for smart meter to HES. Please refer clause 8 of IS 15959 (Part 3).
7.17	Consumer display unit (optional)	Provision of consumer interface unit (CIU) to access meter from consumer premises. Wireless IHD powered by battery.
7.18	Event and tamper detection	Meter shall detect and log any exceptional/ fraud/ tamper conditions in its memory as an event. In addition to this all transactions and control shall also be recorded as an event in meter memory. Each event type shall be identified by an event ID.
7.18.1	Association Rights	Each event shall be available to download as per following association rights. a. Public Client: No access b. Meter Reader: Read only c. Utility Settings: Read only d. Push Services: Read Only for identified events as per ESWF
7.18.2	Compartments of events	Meter shall be able to log events in following compartments a. Voltage Related Events b. Current Related Events c. Power Related Events d. Others Events e. Non Roll Over Events f. Transaction related events g. Control Events
		a. Occurrence and Restoration of Voltage Related, current related, power related and other events shall be logged in meter memory as per IS 15959 (Part 3). Please refer annexure 'A' for description of events, Event ID, Logics of events and threshold values of events. b. Threshold values shall be factory programmable. c. Selective access shall be provided as per clause

		11.3 of IS 15959 (Part 1). d. For each of the events a certain list of parameters shall be captured as per clause 'a' e. For each occurrence event captured, the cumulative tamper count shall be incremented.
7.18.3	Parameter Snapshot	Meter shall capture all the parameters mentioned in table '24' of IS 15959 (part 3) when event occurrence and restoration is logged
7.18.4	Event Logging	The meter shall log minimum 100 tamper events (ensuring at least 20 events for each tamper).
7.18.5	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
7.19	Phasor Representation	Meter shall support parameters required to develop phasors of current and voltage at HES.

8. Meter Display

SN	Item	Description
8.1	LCD Type	STN Liquid crystal with backlit
8.2	Viewing angle	a. Minimum 120 Degree. 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.
8.3	Size of LCD	Minimum 10 X 6mm
8.4	LCD Digits	Total 6+1 digits
8.5	LCD language	English
8.6	Display modes	a. Auto Mode b. Manual Mode c. Sub active mode Display list shall be finalized during detailed engineering in the event of order.
8.7	Display indications	Appropriate indications/flags for all tampers and self diagnostic features should be provided.

9. Data and Communication Protocol/ HES/ Integration/ Software

SN	Item	Description
9.1	Data Exchange protocol	a. Meter should comply Indian companion of data exchange and tariff control specification IS 15959 (Part 3). b. In case of additional requirement from IS 15959 (part 3),

		they shall be as per DLMS standards/ IEC DLMS protocols suite (62056). c. Bidder shall explain in detail the additional parameters/ services/ methods used in meters from IS 15959 (part 3) and its reference to DLMS books/ IEC. d. Prior to manufacturing of meters bidder shall provide a detailed specification explaining all parameters/ services/ methods used in meter in addition to IS 15959 (Part 3).
9.2	Integration with HES	a. Bidder shall work with BRPL IT team/ BRPL designated system integrator to integrate its meter with BRPL HES system as per integration requirements mentioned in annexure 'C'. b. Bidder shall prepare detailed documents as mentioned in above clause and submit it for BRPL approval and integration with HES.
9.3	Base computer software	Licensed Software with the following features should be supplied for free to download meter through optical port.
9.3.1	Operating System	BCS should be compatible for latest Windows operating system.
9.3.2	Security	System shall be password protected where user can login only if login ID is provided by administrator. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
9.3.3	Database	BCS shall maintain master database according to desired area, location, and region etc.
9.3.4	Reporting	a. BCS shall have option of user defined report generation in format of Excel, Word and CSV, XML, PDF etc. b. BCS shall have capability to export data in ASCII, CSV and XML format at desired location so that the same could be integrated with our billing data for processing. c. All the data available in the meter shall be convertible to user defined ASCII, CSV and XML file format.
9.3.5	Data transfer rate	BCS and communication ports should support data transfer rate of 9600 bps (minimum).
9.4	Hand Held Unit Software	a. The manufacturer has to provide software capable of downloading all the data stored in meter memory through window/ android operating system based handheld units (HHU) through optical port. b. In the event of order, bidder shall work with BRPL IT team/ BRPL designated system integrator to develop HHU software for meter downloading and further uploading on HES.

		c. HHU software should have option for selection of parameters to be downloaded from meter. d. Meter data consisting of all parameters and complete load survey for all parameters shall be read by HHU and downloaded on HES in minimum possible time (not more than 5 minutes).
9.5	Training	Manufacture shall impart training to BRPL personnel for usage of software

10. Name Plate

SN	Description
10.1	Meter Serial number shall be of 8 digits. Serial number shall be printed in black colour. Embossing is not acceptable.
10.2	Size of the digit shall be minimum 5X3mm
10.3	Bar code shall be printed along with serial number
10.4	BIS registration mark (ISI mark)
10.5	'BRPL' insignia shall be printed above LCD display.
10.6	BRPL PO No. & date
10.7	Manufacturers name and country of origin
10.8	Model type / number of meter
10.9	Year of manufacturing
10.10	Reference voltage / current rating
10.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
10.12	Meter constant
10.13	Class index of meter
10.14	Reference frequency
10.15	Warranty period
10.16	Name plate of NIC a. Serial no of NIC along/ IMEI no/MAC address with bar code b. Name of purchaser's c. Communication technology with carrier frequency d. Manufacturing year and month. e. Warranty period.

11. Component Specification

SN	Item	Description	Make
11.1	Current Transformers	The Meters should be with the current transformers as measuring	To meet accuracy requirement

		elements.	
11.2	Measurement or 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, Atmel, Phillips, SAMES ,NEC,TEXAS
11.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Hitachi, Compiled
11.4	Display modules	a. The display modules should be well protected from the external UV radiations. b. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). c. It should be STN type industrial grade with extended temperature range min 70 ºC.	Hongkong: Genda Singapore: Bonafied technologies Korea: Advantek China: Success Japan: Hitachi, Sony
11.5	Optical port	The mechanical construction of the port should facilitate the data transfer. Communication shall not disturbed by external light.	USA: National Semiconductors, HP Holland/ Korea: Phillips Japan: Hitachi, Ligitek
11.6	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 in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	SMPS Type
11.7	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal	USA: National Semiconductors, Atmel, Phillips, Texas Instruments. Japan: Hitachi, Oki, AVX or Ricoh Korea: Samsung

		wires.	
		LED	Everlight, Agillent
11.8	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
11.9	Battery	Lithium with guaranteed life of 15 years	Texcell, SAFT, Varta, Tedirun, Sanyo
11.10	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip, TEXAS, Japan: NEC, Oki
11.11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)
11.12	Note	a. The components used by manufacturer shall have "Minimum Life" more than the 10 years. b. Incase vendor want to use other make components; same shall be approved by BRPL before use. c. Even for existing supplier – fresh approval is needed for all deviations. d. Manufacturer should have complete tracking of material used in meter. BRPL reserve the right to carry out audit of inventory/ manufacturing process at manufacturer's works and sub vendor's work.	

12. Quality Assurance, Inspection and Testing

SN	Item	Description
12.1	Vendor's Quality	To be submitted for Purchaser's approval.

	Plan (QP)	
12.2	Sampling Method	Sampling Method for quality checks shall be as per relevant IS/ IEC/ CBIP guidelines and Purchaser's prior approval shall be taken for the same.
12.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.
12.4	Type Tests	a. The meter shall be of type tested quality including all tests specified in this specification which are beyond IS / IEC or CBIP. b. Type test conducted from CPRI/ ERDA/ or any other lab specified by BIS/ CEA for smart meter testing will be treated as valid. c. Type test certificate should be submitted along with offer for scrutiny. d. Any other component supplied in addition to meter shall also be type tested as per IS /IEC if applicable. e. Complete type test as per IS 16444 (Part 3) shall be carried out on sample selected from BRPL lot.
12.5	Routine tests	All test marked "R" as per table 20 of IS 13779.
12.6	Acceptance Tests	a. All tests marked "A" as per table 20 of IS 13779. b. Smart meter functional tests as per IS 16444 Part 2 c. Test of load switch as per clause 10.4 of IS 16444 (Part 2) d. Test for data exchange protocol as per clause 10.5 of IS 16444. e. Test for Smart meter communicability as per clause no. 10.6 of IS 16444 (Part 2). f. All the routine and acceptance tests shall be carried out as per relevant standards. g. Following tests in addition to IS shall be conducted during lot inspection. I) Dimensional and drawing verification. II) Display parameters/ sequence. III) Data Downloading from CMRI and PC. IV) Tamper/ fraud detection/logging features as per approved documents. Tamper conditions will be simulated at varying load up to Imax. Accuracy will also be checked during tamper simulation. V) Burn in chamber test. VI) Component verifications. h. Purchaser reserves the right to formulate any other test method to verify guaranteed parameters of Meter.

12.7	ESD and Magnetic Interference test	ESD and magnetic interference test will be conducted at Samir lab, Chennai or CPRI.
12.8	Inspection	a. Purchaser reserves the right to inspect /witness all tests on the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards. b. Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per clause 14.3 relevant standards and tampers logics as per approved GTP. All the equipments including tamper logs kits/ jigs should be calibrated. c. In-process and / or final inspection call intimation shall be given in advance to purchaser.

13. Packing, Marking, Shipping, Handling and Storage

SN	Item	Description
13.1	Packing	a. Each meter must be packed, together with its terminal cover, in a separate environmental friendly cardboard box, which can be opened and re-closed without needing adhesives. b. Up to 4 to 5 three-phase meters must be packed together with their terminal covers in a group cardboard box, which can be opened and re-closed without needing adhesives. c. The box shall prevent, as much as possible, penetration of dust during long storage periods. The box must be designed for multiple use and be robust, with wall thickness of at least 4 mm. d. Maximum weight of a group meter box shall not be more than 25 Kg. e. The packaging will protect the meters against shock and vibration, preventing damage due to the road conditions during transport and distribution in the field. The electrical and mechanical properties shall not be affected by these disturbances. f. For shipping the boxed meters will be close packed by stockpiles of suitable quantities on pallets. The meters numbers sequence (without partition) shall be kept in each pallet. A pallet will be protected against moisture by a polyethylene hood, covered with a cardboard cover (hood), and fixed onto the pallet by parallel

		polypropylene bands, using protection angle bars at the corners. The hood shall be marked – on the front (wide side), on the narrow side and on the top as per clause 13.3. g. Each pallet should contain between 70 and 300 meters. The actual number of meters on each pallet will be agreed with the BRPL in the event of order. h. An impact detector ("Shock-Watch") label shall be attached to the cardboard hood of several pallets in each container/ transport truck, to warn of possible rough handling during shipment, transport and storage.
13.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label.
13.3	Marking	On each group box and pallet, following details are required both on front (wide side) and top: a. BRPL logo. b. Meter serial number range along with bar code. c. Unique number of box/ pallet. d. Purchaser's name e. PO number (along with SAP item code, if any) & date with bar code f. Equipment Tag no. (if any) g. Destination h. Manufacturer / Supplier's name i. Address of Manufacturer / Supplier / it's agent j. Type , rating and other description of equipment k. Country of origin l. Month & year of Manufacturing m. Case measurements n. Gross and net weights in kilograms o. All necessary slinging and stacking instructions
13.4	Test reports	Routine test report to be provided with each meter
13.5	Shipping	The seller shall be responsible for all transit damage due to improper packing.
13.6	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet /manual to be furnished before commencement of supply.

14. Deviations

14.1	Deviations	a. Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. b. In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.

15. Drawing Submission

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

SL	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Tamper Sheet	Required	Required	
4	Display Parameters	Required	Required	
5	GA / cross sectional drawing of Meter showing all the views / sections	Required	Required	
6	Detail of network interface i.e. pin out, standard, voltage level etc and its integration requirement.	Required	Required	
7	Samples of each type and rating offered and RF NIC/ communication module of already integrated RF card as per tender qualifying criteria.	2 no's	1 no's	
8	Any software and accessories required for installation/ operation of meter	Required	Required	
9	Manufacturer's quality assurance plan and certification for quality standards	Required		
10	Type Test reports of offered model/ type/ rating	Required		
11	BIS certificate	Required		
12	Complete product catalogue and user manual.	Required		
13	Customer Reference List	Required		
14	Recommended list of spare and accessories	Required		
15	Specification documents containing all parameters, Services, Methods in addition to companion specification of IS 15959 (part 2).		Required	
16	Program for production and testing (A)		Required	Required

17	Makes of components		Required	Required
18	Detailed installation and commissioning instructions		Required	Required
19	As Built Drawing		Required	Required
20	Operation and maintenance Instruction as well as trouble shooting charts/ manuals		Required	Required
21	Inspection and test reports, carried out in manufacturer's works			Required
22	Routine Test certificates			Required
23	Test certificates of all bought out items			Required
24	Meter Seal data			Required
25	Mapping of meter serial no to Communication card.			Required

16. Delivery

16.1	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.

Annexure – A: Guaranteed Technical Particulars

Bidder shall furnish the GTP format with all details against each clause of this specification.
Bidder shall not change the format of GTP or clause description.
Bidder to submit duly filled GTP in hard copy format with company seal.

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

Bidder / Vendor seal / signature ----------

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number and email id	

Annexure – B: Recommended Accessories / Spares

SL	Description of spare part	Unit	Quantity
1		No	
2		No	
3			

Annexure – C: Integration Requirement of Meters with NIC and HES

Integration requirements with communication provider of BRPL/ any other agency designated by BRPL for other components of AMI.

a. Bidder(s) must share the meter security keys, all level encryption, and password information along with asset information in a format with the buyer / communication provider of BRPL so that during AMI business flow, the device and data can be authenticated all the time.
b. Bidder(s) must share the details of meter communication specifically programmed protocols.
c. Bidder(s) must share the meter configuration source code to the BRPL/ communication provider of BRPL.
d. Bidder (s) must share the meter interface touch points for external applications/ systems.
e. Bidder(s) must share the required APIs including but not limited to reading APIs, configuration APIs and Functional APIs with the System Integrator for execution of business flow (Installation, reading, configuration).
f. Bidder(s) must share the data storage and retrieval details.
g. Bidder(s) must configure the devices to be upgraded remotely (OTA) and share the required firmware source code (with updates over the project life) with system integrator as and when it is required in case of feature request or fault correction.
h. Bidder(s) must follow and conduct Utility's sample and periodic test program, including (but not limited to) the selection of a sample population of meters, sharing of sample test results as reported by the meter testing systems with the system Integrator.
i. Bidder(s) must share the information related to communication module for the authorization purpose at to BRPL/ communication provider of BRPL.

Annexure – D: Tamper and Fraud Detection/Events

1. Voltage Related Events:

Description of event	Logic Of Event	Logic Expression/ Threshold values	Persistence Time
R Phase Voltage Missing (Occurrence/ Restoration)	Absence of potential on any phase should be logged. Restoration of normal supply shall also be recorded. The threshold value of voltage should be programmable at factory end.	Occurrence: If Vpn<10% Vref and Ip>10% Ib Restoration: If Vpn>=10% Vref and Ip>10% Ib	Occurrence: 5 Min Restoration: 5 Min
Y Phase Voltage Missing (Occurrence/ Restoration)			
B Phase Voltage Missing (Occurrence/ Restoration)			
Over Voltage (occurrence/ restoration)	Meter should log high voltage event if voltage in any phase is above a threshold value. Threshold value if factory programmable.	Occurrence: If Vpn>10% Vref Restoration: If Vpn<=10% Vref	Occurrence: 5 Min Restoration: 5 Min
Low Voltage (occurrence/ Restoration)	Meter should log low voltage event if voltage in any phase is below a threshold value. Thershold value if factory programmable.	Occurrence: If Vpn<75% Vref Restoration: If Vpn<=75% Vref	Occurrence: 5 Min Restoration: 5 Min
Voltage Unbalance (Occurrence/ Restoration)	Meter should log voltage imbalance event when the difference between minimum and maximum phase voltage is more than a threshold value. Threshold value should be factory programmable.	Occurrence: If Vmax-Vmin>30% Vref Occurrence: If Vmax-Vmin<=30% Vref	Occurrence: 5 Min Restoration: 5 Min
High harmonic in R Phase Voltage	Meter should occurrence of high harmonic in voltage if % THD in voltage of any phase shall be more than a threshold value.	Occurrence: If %THD in Voltage>=5% Restoration: If %THD in Voltage<5%	Occurrence: 5 Min Restoration: 5 Min
High harmonic in Y Phase Voltage			
High harmonic in in B Phase Voltage			

2. Current Related Events:

Description of event	Logic Of Event	Logic Expression/ Threshold values	Persistence Time
Current Reverse/ R Phase Current Reverse (occurrence/ Restoration)	Meter should log the event of reversal of C.C polarity. Meter should register energy consumed correctly with any one, two or all three current coils reversed. This event shall not be valid in bidirectional mode of metering.	Occurrence: If Ip = -ve direction Restoration: If Ip=+ve direction	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Reverse (occurrence/ Restoration)			
B Phase Current Reverse (occurrence/ Restoration)			
R Phase Current Open (Occurrence/ Restoration)	Meter should log the event of current coil open. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)>20% *Ib and I<10% Ib* *Vector Sum($I_R+I_Y+I_B+I_N$)>20% Ib*	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Open (Occurrence/ Restoration)			
B Phase Current Open (Occurrence/ Restoration)			
Current Unbalance (Occurrence/ Restoration)			
Current Bypass (Occurrence/ Restoration	Meter should log the event of current coil shorting/bypass. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)>20% *Ib and I (any Phase) >5% Ib* *Vector Sum($I_R+I_Y+I_B+I_N$)>10% Ib*	Occurrence: 5 Min Restoration: 5 Min
Over current	If the current in any phase	Occurrence: If Ip>Imax	Occurrence: 5

(occurrence/ restoration)	exceeds the specified threshold current, meter should log over current event.	Restoration: If Ip<=Imax	Min Restoration: 5 Min
High current in R Phase High current in Y Phase High current in B Phase	Meter should occurrence of high harmonic in current if % THD in current of any phase shall be more than a threshold value.	Occurrence: If %THD in Current>=5% Restoration: If %THD in Current<5%	Occurrence: 5 Min Restoration: 5 Min
High Neutral Current	Meter should log occurrence of high neutral current if neutral current shall be more than a threshold value.	Occurrence: If I_N > 50% of average phase current Restoration: If I_N < 50% of average phase current	Occurrence: 5 Min Restoration: 5 Min

3. Power Related Events:

Description of event	Logic Of Event	Logic Expression/ Threshold values	Persistence Time
Power OFF (occurrence/ restoration)	Meter shall detect power OFF if all phase voltages are absent. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded.		
Abnormal Power Off (Occurrence/ restoration)	If meter micro detect power off whereas phase voltage is present than abnormal power will be recorded. Meter sall continue to record energy as per phase voltage and current.	Occurrence: If voltage at meter power supply<10% vref and Vpn>20% vref. Restoration:	NA

4. Other Events:

Description of event	Logic Of Event	Logic Expression/ Threshold values	Persistence Time

Abnormal External Magnetic Influence (Occurrence/ Restoration)	a. Meter should either be immune or should log the events of attempt of tampering by external magnetic field as per relevant IS14697/ CBIP 325 with latest amendments. b. If the working of meter gets affected under the influence of external magnetic field, meter should record energy at Imax. Meter should not compute c. MD during this period. The meter shall record energy as per actual load once the magnetic field is removed.	As per IS 14697/ CBIP 325	As per IS 14697
Neutral Disturbance- HF, DC and Alternating (occurrence/ restoration)	Meter should log the event when AC/DC/ Pulsating voltage is injected in neutral circuit.	As per manufacturing standard.	Bidder shall define threshold values
Low Power Factor	Meter shall able to detect and log the low PF event if power factor of the load found between 0.2 to 0.5 for a load above than a % threshold value for a threshold time value. Event shall restore if PF factor of load remain out of range 0.2 to 0.5 for a load above than % threshold value for		10% of I basic
Single Wire			100 ma

Operation (occurrence/ Restoration)			
Plug in Communication module removal (Occurrence/ Restoration)	Meter should log the removal of communication card. Meter should also log insertion of communication card.	By NC switch/ sensor	
Configuration change to post-paid mode/ pre-paid mode	Meter should log the change in payment mode configuration.		
Configuration change to “Forwarded” only" mode/ “Import and Export” mode	Meter should log the change in metering mode configuration.		
Overload (Occurrence/ Restoration)	Meter should able to log the status of overload in KW		
HV Spark (Occurrence/ restoration)		On detection of HV spark	
Terminal Cover Open	Meter should log the occurrence and restoration of terminal cover.	By NC switch/ sensor	
Distorted PF	Meter should log the event if difference between displacement PF and actual PF is more than a threshold value		Occurrence: 5 Min Restoration: 5 Min
Time based event stamp	Meter should log voltage, current, PF and energy consumption on a predefined time	As per predefined time	NA

5. Non Roll over events:

Event Description
Occurrence of cover open

6. Transaction Related Events:

Detail of Transaction
Real Time Clock- Date and Time
Demand Integration Period
Profile Capture Period
Single Action schedule for billing date
Activity calendar for time zones
New firmware activated
Load Limit (Kw) Set
Enable Load Limit Function
Disable load limit function
LLS secret (MR) change
HLS key (US) change
HLS key (FW) change
Global key change
ESWF change
MD reset

Note:

1. Event ID's shall be defined as per BRPL specification/ IS 155959 (part 2). Approval shall be taken from BRPL prior to manufacturing for Event ID's
2. Programming of threshold values should be possible from remote via proper authentications.
3. Logics of tampers can be changed/ upgraded via firmware up gradation from remote via proper authentication.
4. All the programming changes/ firmware up gradations shall be logged along-with date and time stamp in meter as well as on HES.

Technical Specification for DT Smart Meter

Document number: BR/18-19/SM/DT/01

June 2018

Prepared By	Reviewed by	Approved By
Md. Akhtar Ansari 5.6.18	05/06/18	05/06/18.
Md. Akhtar Ansari	**Rishi Goyal**	**Sheshadri Krishnapura**

Index

Record of Revision

Item/Clause No.	Change in Specification	Reason of Change	Approved By	Rev

1. Scope of Supply

This specification covers the following for Three Phase 240 V, 5A-10A AC Static transformer operated Watt hour and Var Hour smart meters of accuracy class 0.5s with plug in communication module (RF mesh only and RF + Cellular technology).

A. Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.

B. Any accessories / hardware required for installation and operation for the meter.

2. Codes and Standards

Materials, equipment and methods used in the manufacturing of above mentioned equipment shall conform to the latest edition/ of following

S No.	Standard Number	Title
2.1	Indian Electricity Act	IE Act 2003
2.2	CEA Metering Regulations	With latest amendments
2.3	CBIP Manual (Pub no.-325)	Standardization of AC Static Electrical Energy Meters
2.4	IS- 16444 (Part 2)	AC Static Transformer Operated Watt-hour And Var-hour Smart Meters, Class 0.2 S, 0.5 S And 1.0 S Part 2 Specification Transformer Operated Smart Meters
2.5	IS- 14697	ac Static Transformer Operated Watt-hour and Var-hour Meters, Class 0.2 S and 0.5 S
2.6	IS-15959 (Part 1)	Data Exchange for Electricity Meter - Reading Tariff and Load Control - Companion Specification
2.7	IS-15959 (Part 2)	Data Exchange for Electricity Meter - Reading Tariff and Load Control (Part 2)- Companion Specification for smart meter
2.8	IS-15959 (Part 2)	Data Exchange For Electricity Meter Reading, Tariff And Load Control-Companion Specification Part 3 Smart Meter (Transformer Operated Kwh And KVARh Class 0.2 S, 0.5 S And 1.0 S
2.9	IS- 11448	Application guide for AC Electricity meters
2.10	IEC- 62052-11	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
2.11	IEC- 62053-21	Electricity metering equipment (A.C) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)
2.12	IEC- 62053-52	Electricity metering equipment (AC) - Particular requirements - Part 52: Symbols
2.13	IEC 62053-61	Electricity metering equipment (A.C.) - Particular requirements - Part 61: Power consumption and voltage requirements

2.14	IEC 62058-11	Electricity metering equipment (AC) - Acceptance inspection - Part 11: General acceptance inspection methods
2.15	IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
2.16	IEC 60736	Testing Equipment for electrical Energy meter
2.17	IS/IEC/TR 62051:Part 1:2004	Electricity Metering — Data Exchange For Meter Reading, Tariff And Load control — Glossary Of Terms Part 1 Terms Related To Data Exchange With metering Equipment Using DLMS/ COSEM
2.18	IEC 62056-1-0:2014	Smart metering standardisation framework
2.19	IEC 62056-3-1:2013	Use of local area networks on twisted pair with carrier signalling
2.20	IEC 62056-4-7:2014	DLMS/COSEM transport layer for IP networks
2.21	IEC 62056-5-3:2017	DLMS/COSEM application layer
2.22	IEC 62056-6-1:2017	Object Identification System (OBIS)
2.23	IEC 62056-6-2:2017	COSEM interface classes
2.24	IEC 62056-6-9:2016	Mapping between the Common Information Model message profiles (IEC 61968-9) and DLMS/COSEM (IEC 62056) data models and protocols
2.25	IEC 62056-7-3:2017	Wired and wireless M-Bus communication profiles for local and neighbourhood networks
2.26	IEC 62056-7-5:2016	Local data transmission profiles for Local Networks (LN)
2.27	IEC 62056-7-6:2013	The 3-layer, connection-oriented HDLC based communication profile
2.28	IEC TS 62056-8-20:2016	Mesh communication profile for neighbourhood networks
2.29	IEC TS 62056-9-1:2016	Communication profile using web-services to access a DLMS/COSEM server via a COSEM Access Service (CAS)
2.30	IEC 62056-9-7:2013	Communication profile for TCP-UDP/IP networks
2.31	IEC 62056-21:2002	Direct local data exchange
2.32	DLMS- White Book	Glossary of DLMS/COSEM terms
2.33	DLMS- Blue Book	COSEM meter object model and the object identification system

2.34	DLMS- Green Book	Architecture and protocols to transport the model
2.35	DLMS- Yellow Book	Conformance testing process
2.36	IEEE 802.15.4	Standard for Local and metropolitan area networks.
2.37	IEEE 802.15.4u	Standard for Local and metropolitan area networks (Use of the 865 MHz to 867 MHz Band in India)
Order of precedence between different standards shall be as follow:		
i	Indian Standards Issued By BIS	
ii	IEC standard	
iii	Other standards like CBIP, DLMS etc.	

3. Service Conditions

SN	Item	Description
3.1	Temperature Range	Operation range: -10 Deg C to 55 Deg C Limit range of operation: -25 to 60 Deg C Limit range of storage / transport : -25 to 70 Deg C
3.2	Relative Humidity	0 to 96 %

4. Distribution System Data

SN	Item	Description
4.1	Supply	3 Phase AC, 4 wire
4.2	Voltage	415 V ± 6%
4.3	Frequency	50 Hz ± 5%
4.4	System Neutral	Solidly Earthed

5. Electrical and Accuracy Requirement

SN	Item	Description
5.1	Meter Type	3- ø, 4 wire static Transformer Operated Smart Meter
5.2	Connection	Direct / whole current
5.3	Rated Voltage	240V (phase to neutral) with variation of +30% & -40%. However meter should withstand the maximum system voltage.
5.4	Rated Current	Ib -5A and Imax- 10 A
5.5	Starting current	0.1 % of base current
5.6	Rated Frequency	50Hz +/- 5%
5.7	Accuracy Class	0.5s (IS14697 applies for accuracy requirements)
5.8	Power Consumption	As per IS 16444 (Part 2)

		Meter with lowest power consumption shall be preferred.
5.9	Meter constant	Imp/ unit (Bidder to specify meter constant)
5.10	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.11	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.12	Influence of supply voltage	As per IS 14697
5.13	Short time over current	As per IS 14697
5.14	Immunity to phase and earth fault	As per IS 14697
5.15	Influence of Self Heating	As per IS 14697
5.16	Influence of Heating	As per IS 14697
5.17	Electromagnetic compatibility	a. Meter shall remain immune to electrostatic discharge (upto and including 35KV), electromagnetic HF field and fast transient burst. b. The meter shall be designed in such a way that conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not influence the meter. c. Meter shall be type tested for electromagnetic compatibility. d. Meter shall comply requirement of IS 14697
5.18	Limits of error due to influence quantities	Meter shall work within guaranteed accuracy as per IS 14697/ IEC62053-21/ CBIP325 (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: BRPL reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.

6. Construction Feature

SN	Item	Description
6.1	Base Body	Material - Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level.
6.2	Top Cover	a. Material: Transparent/Opaque and UV stabilized polycarbonate of grade LEXAN 143/ 943 or Equivalent with V0 inflammability level. b. Top cover and base should be Ultrasonically/Chemically welded.
6.3	Terminal Block	a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent. b. Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135C and pressure of 1.8MPa. The terminals shall be designed so as to ensure adequate and durable contact such that there is no risk of loosening or undue heating.
6.4	Terminal cover	a. Material - UV stabilized transparent/Opaque polycarbonate cover b. Provision of sealing at two points through sealing screw. c. The sealing screws shall be held captive in the terminal cover. d. The terminal cover shall be extended type 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. Terminal cover should have provision for cable entry from bottom. e. Diagram of external connections should be embossed on terminal cover. Sticker is not acceptable.

		f. Mechanism shall be provided to record an event with occurrence and restoration in case of meter enclosure/ terminal cover is opened.
6.5	Terminals	a. Terminals shall be suitable for 6 Sqmm copper wire. b. Two no's flat head screws per terminal shall be provided c. Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % Imax. d. Terminals shall be clearly marked for phase / neutral / outgoing etc. e. Clearances and creep age shall be as per IS 14697.
6.6	Ingress Protection	IP 55 or better, but without suction in the meter.
6.7	Output device	Meter should 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.
6.8	RTC	a. The meter shall have internal real time crystal clock to set date and time. b. Meter should have capability of Time synchronization through optical port/ remote communication. c. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. d. No separate battery required for RTC. e. HES will sync RTC at least once a day.
6.9	Battery	Lithium ion battery with guaranteed shelf life of 10 years and capacity life of 15 years. Lithium thioyl Chloride battery will be preferred. In case battery removal or total discharge same should not affect the working & memory of the meter.
6.10	Memory	Non volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power.
6.11	Self Diagnostic feature	Meter shall have self diagnostic for the following a. Date and RTC. b. Battery. c. Non volatile memory. d. Display
6.12	Status Signals	Meter shall have following digital and analog inputs and outputs: 1. 4 no's Digital Inputs

		2. 4 no's Digital outputs 3. 2 no's analog inputs.
6.13	Optical port	Meter shall have an optical port with a metal ring to hold magnet of probe. Optical port shall comply with hardware specifications provided in IEC-62056-21.
6.14	Communication Module Interface	a. Meter should have the provision for 01 no's plug in communication module for connectivity. The same interface shall be compatible with both Cellular and RF communication technologies interchangeable according to the site. b. Interface shall support data transfer between meter and network interface card over UART/ RS232. c. Meter shall have mechanism to log communication module removal as an event in its memory with date and time stamp. d. Meter Vendor shall work with BRPL designated RF provider to integrate their module in their meter. e. Preferred location of communication card module shall be on top of meter
6.14.1	Communication modules	a. Smart meter shall have 01 no's plug-in type communication modules/ Network Interface card (NIC) for connectivity of meter to HES from following options as per tender requirement: i. Communication Module/ NIC Type 1: RF based suitable for communication Network of BRPL designated RF canopy provider. ii. Communication Module/ NIC Type 2: RF and Cellular communication module (LTE 4G with 3G and 2G fall back as per Indian telecom Standards). b. Meter shall have separate indications on display/ for remote and local communication. c. Communication module shall held in a casing which can be directly plugged in the meter. Sealing screw shall be provided.
6.15	Last Gasp	Meter shall have provisions to provide last gasp signals through communication module in case of power failure. Bidder should explain in detail the provisions provided in meter to achieve the requirement.
6.16	Meter Sealing Arrangement	Sealing should be in accordance with IS and CEA metering regulations with latest amendments. Approval shall be taken

		from purchaser for location of seals.
6.16.1	Manufacturer's Seals	a. One Polycarbonate seal to be provided on meter cover. b. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram).
6.16.2	BRPL Seals	a. Minimum one seal as Hologram type, numbered with hologram transfer on tamper proof paper seal. Seal should not be just Hologram sticker (100% hologram). Meter sides should not have sharp edges to avoid damage to hologram seals. b. Minimum one Polycarbonate seal should be provided on top cover. c. Seals will be issued to manufacturer free of cost. d. 02 no's polycarbonate seals shall be provided for communication module.
6.16.3	Seal record	Record of all seals shall be forwarded to purchaser with each lot.
6.17	Name Plate and marking	a. Meter should have clearly visible, indelible and distinctly marked name plate in accordance with IS 16444 (Part 2) & clause no. 9.0 of this specification. b. All markings and details shall be printed by laser only. c. Paper stickers are not allowed for name plate.
6.18	Resistance against heat and fire	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 14697.
6.19	Meter Box	a. Polycarbonate meter box for outdoor use with IP55 rating shall be provided. b. Meter box shall be hinged type with suitable sealing arrangements. c. Material used should have flammability level FV0. d. All the metal hardware should be stainless steel or galvanized. e. Optical to RS 232 (DB9) cable shall be provided for meter downloading.

6.20	Guarantee	a. 7.5 years from the date of dispatch or 7 year from date of commissioning, whichever is earlier b. Manufacturer shall undertake a guarantee to replace meter up to a period of 7 Year from the date of supply. The meters which are found defective/inoperative within the guarantee period shall be replaced as per meter service level agreement.

7. Functional Requirement

SN	Item	Description
7.1	Meter category	Smart meter comply with D4 category of IS 15959 (Part 3).
7.2	Mode of metering	Mode of metering shall be bidirectional i.e. both import and export recording shall be done. No change in metering mode shall be possible either by remote or local.
7.3	KVAH Calculation	Lag+Lead
7.4	MD calculation	Block / sliding window with default demand integration period of 1800 s configurable to 900 s as per requirement. Meter should be configurable for block/ sliding window at the time of manufacturing. This change should not be possible in the field. Extended register shall be used for MD recording.
7.5	TOU Metering	a. Meter shall be capable of doing TOD metering in minimum 4 tariff rate registers programmable for minimum 8 time zones and 4 seasonal profiles. b. TOU metering shall be implemented by the activity colander method of IS 15959 Part 1 clause 9/ DLMS UA-1000-1 c. Special Day table shall be defined as per IEC/ DLMS UA-1000-1 d. Default TOU programming shall be as per latest DERC guidelines. Prior approval shall also be taken from BRPL for the same. e. Tariff rate registers shall be as follow R1: Rate register for Peak R2: Rate register for Normal R3: Rate Register for Off Peak

7.6	Instantaneous Parameters	All the parameters mentioned in table '14' of IS 15959 (Part 3) along with following additional parameters shall be supported by meter. a. Neutral Current (I_N) b. Earth voltage with respect to neutral voltage (V_{EN}) c. Y phase voltage angle with respect to R Phase Voltage d. B phase Voltage angle with respect to R phase Voltage e. % TDH in R phase Voltage f. % THD in Y Phase Voltage g. % THD in B Phase Voltage h. % THD in R phase Current i. % THD in Y Phase Current j. % THD in B Phase Current k. Displacement PF l. RF/ GSM signal Strength in milli db. m. GPS Coordinates. Method of Measurement for harmonic parameters at sl no. 'b' to 'g' shall confirm to the IEEE 519, 2014.
7.6.1	Association Rights	As per Clause 17.1 of IS 15959 (Part 3).
7.7	Billing data	a. Billing parameters shall be generated at the end of each billing cycle and stored in memory as per provisions provided in clause no. 20 of IS 15959 (Part 3). b. 6 no's billing cycle parameters shall be remain in meter memory along with current cycle parameters and shall be available for reading as well as profile and or 'by entry' for selective access. c. All the parameters mentioned in table '17' of IS 15959 (Part 3) shall be supported by meter.
7.7.1	Association Rights	As per clause 20 of IS 15959 (Part 3).
7.7.2	Selective access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.7.3	Billing period reset/ MD reset	00:00 Hrs of Ist of every month
7.7.4	Billing period reset mechanism	As per clause 10 of IS 15959 (Part 1)
7.7.5	Billing period counter	Cumulative billing period counter since installation and available billing periods shall be provided as per clause

		11.2 of IS 15959 (Part 1).
7.8	Load survey Data	a. Load survey parameters shall be measured and recorded at the end of each profile capture period for last 35 Power ON days. b. All the parameters mentioned in table '15' of IS 15959 (Part 3) along with following additional parameters shall be supported by meter: % THD in R phase Voltage % THD in Y Phase Voltage % THD in B Phase Voltage % THD in R phase Current % THD in Y Phase Current % THD in B Phase Current
7.8.1	Profile capture period	Default 1800 s programmable to 900 s.
7.8.2	Selective Access	Support for selective access shall be provided for billing parameters as per clause no 11.3 of IS 15959 (part 1).
7.8.3`	Association Rights	As per clause no.18 of IS 15959 (Part 3)
7.9	Daily load profile	Daily load profile parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 35 Power ON days. All the parameters mentioned in table '16' of IS 15959 (Part 3) shall be supported by meter as Daily load profile parameters.
7.9.1	Association Rights	As per clause no. 19 of IS 15959 (Part 3)
7.10	General Purpose Parameters	Following parameters shall be provided in Non Volatile memory (NVM) of the meter as per clause 26 of IS 15959 (Part 3).
7.10.1	Name Plate Detail	As per Table '25' of IS 15959 (Part 3) with following additional parameters. a. Month of manufacturing.
7.10.1.1	Association Rights	As per clause no. 26.1 of IS 15959 (Part 3)
7.10.2	Programmable parameters	These 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. Programming of any of the parameters shall increment the 'Cumulative programmable count' value. All the parameters mentioned in table '26' of IS 15959 (Part 3) shall be supported by meters with following additional parameters:

		a. GPS coordinates.
7.10.2.1	Association rights	As per Clause no. 26.2 of IS 15959 (Part 3).
7.10.3	Push Services	a. Smart meter is able to automatically notify data, event, and messages to a destination client system in an unsolicited manner (without a request from a client) as per clause no 6 of IS 15959 (Part 2). b. Randomization: Data from different endpoints shall be pushed intelligently on the network in order to avoid excessive traffic on the network for example in case all the endpoints will push load survey data simultaneously, then it may result in network choking or inefficient performance. Therefore with the help of intelligent techniques such field scenarios shall be handled effectively. c. It shall also be possible to configure push services for all profiles i.e instantaneous, billing, load survey, daily energy and events. Bidder should explain its capability to configure push services. However following push services shall be available by default. i. Load survey profile data at after every 4 hours configurable to any predefined interval. ii. Mid night data at 00:00 hrs of every day. iii. Billing profile data on occurrence of billing.
7.10.3.1	Periodic push (Smart meter to HES)	a. Meter shall be able to push instantaneous parameters to HES at predefined intervals. Parameters required for push shall be intimated during detailed engineering in the vent of order. b. Other attributes as per IS 15959 (Part 3) i.e. Send Destination, Communication window, Randomization time interval, number of retries and repeat delay shall be decided in the event of manufacturing.

7.10.3.2	Event Push (Smart meter to HES)	a. Meter is able to report HES, the status change of any of the identified events mapped in to event status word (ESW) of size 128 bits by pushing following objects to HES. i. Device ID ii. Push Setup ID iii. Real time clock- Date and Time iv. Event Status Word 1 (ESW 1). b. Each of the bits in ESW shall reflect the current state of the event and are mapped against each of the identified events. c. An event status word filter (ESWF) of 128 bit shall also be provided to configure events for event push. Events which are supported in meter shall only be configured for event push. Bit value 1 in ESWF shall indicate that the event is supported and value 0 indicates that event is not supported for event push. Position of the event bit in ESWF shall be same as in ESW.
7.10.3.3	Event status Bit mapping	a. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. b. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3. c. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. d. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade. e. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory. f. Meter shall support capability to self register the meter with new firmware. g. The execution time of the change of the firmware within the meter should be below 1 minute

7.11	Firmware upgrade	h. Smart meter shall support remote firmware upgrade feature for meter firmware without loss of any data and metrology for a part or complete firmware of meter. i. Firmware upgrade shall use the Image transfer classes and mechanisms specified in IEC62056-6-2 and IEC62056-5-3. j. Broad cast facility shall be supported in HES for simultaneously upgrading the firmware of a group of meters installed in field. k. Firmware upgrade feature shall be provided with proper security. The design shall take into account field scenarios such as power failure during F/W upgrade. l. Once the firmware is upgraded, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory. m. Meter shall support capability to self register the meter with new firmware. a. The execution time of the change of the firmware within the meter should be below 1 minute
7.12	Support for broadcast message	Meter shall support connection less messaging services of DLMS to support broadcast messages for a group of meters for following actions: a. Gap reconciliations. b. Firmware upgrade. c. On demand readings d. Meter connection and disconnection. e. Updating of Programmable parameters
7.13	First breath and last gasp	a. In Last Gasp endpoint shall send the power outage notification with Time Stamp. In case of power failure meter communication module shall not draw power from the backup battery. b. For the purpose of sending the Last Gasp, communication module shall have proper power backup (like a super capacitor).
7.14	Security	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided.
7.14.1	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
7.14.2	Encryption/ Authentication	As per clause 7.2 of IS 15959 (Part 2)

	for data transport	
7.14.3	Key requirement and handling	As per clause 7.3 of IS 15959 (Part 2)
7.14.4	NIC Security	a. Proper security at end points as well as network level shall be present to prevent unauthorized hacking of the end points or the network itself. b. The meter password is required to open a session between NIC and meter and is required to gain clearance from the meter to perform requested operation. c. If clearance not gains, the meter locks out communication for 1 minute. The meter maintain counter for monitoring of unsuccessful attempts of performing meter operations and alerts to HES. The counter is incremented each time a password clearance operation fails. d. Up to 3 no's successful attempts are allowed, after which the port is locked out until authenticated from system administrator.
7.15	IP communication profile support	Meter shall support TCP-UDP/ IP communication profile for smart meter to HES. Please refer clause 8 of IS 15959 (Part 3).
7.16	Consumer display unit (Optional)	Provision of consumer interface unit (CIU) to access meter from consumer premises. Wireless IHD powered by battery.
7.17	Event and tamper detection	Meter shall detect and log any exceptional/ fraud/ tamper conditions in its memory as an event. In addition to this all transactions and control shall also be recorded as an event in meter memory. Each event type shall be identified by an event ID.
7.17.1	Association Rights	Each event shall be available to download as per following association rights. a. Public Client: No access b. Meter Reader: Read only c. Utility Settings: Read only d. Push Services: Read Only for identified events as per ESWF
7.17.2	Compartments of events	Meter shall be able to log events in following compartments a. Voltage Related Events b. Current Related Events c. Power Related Events d. Others Events

		e. Non Roll Over Events f. Transaction related events g. Control Events
		a. Occurrence and Restoration of Voltage Related, current related, power related and other events shall be logged in meter memory as per IS 15959 (Part 3). Please refer annexure 'A' for description of events, Event ID, Logics of events and threshold values of events. b. Threshold values shall be factory programmable. c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part 1). d. For each of the events a certain list of parameters shall be captured as per clause 'a' e. For each occurrence event captured, the cumulative tamper count shall be incremented.
7.17.3	Parameter Snapshot	Meter shall capture all the parameters mentioned in table '24' of IS 15959 (part 3) when event occurrence and restoration is logged
7.17.4	Event Logging	The meter shall log minimum 100 tamper events (ensuring at least 20 events for each tamper).
7.17.5	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
7.18	Phasor Representation	Meter shall support parameters required to develop phasors of current and voltage at HES.

8. Meter Display

SN	Item	Description
8.1	LCD Type	STN Liquid crystal with backlit
8.2	Viewing angle	a. Minimum 120 Degree. 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.
8.3	Size of LCD	Minimum 10X5mm
8.4	LCD Digits	Total 6+1 digits
8.5	LCD language	English
8.6	Display modes	a. Auto Mode b. Manual Mode

		c. Sub active mode Display list shall be finalized during detailed engineering in the event of order.
8.7	Display indications	Appropriate indications/flags for all tampers and self diagnostic features should be provided.

9. Data and Communication Protocol/ HES/ Integrations/ Software

SN	Item	Description
9.1	Data Exchange protocol	a. Meter should comply Indian companion of data exchange and tariff control specification IS 15959 (Part 2). b. In case of additional requirement from IS 15959 (part 2), they shall be as per DLMS standards/ IEC DLMS protocols suite (62056). c. Bidder shall explain in detail the additional parameters/ services/ methods used in meters from IS 15959 (part 2) and its reference to DLMS books/ IEC. d. Prior to manufacturing of meters bidder shall provide a detailed specification explaining all parameters/ services/ methods used in meter in addition to IS 15959 (Part 3).
9.2	Integration with HES	a. Bidder shall work with BRPL IT team/ BRPL designated system integrator to integrate its meter with BRPL HES system. b. Bidder shall prepare detailed documents as mentioned in above clause and submit it for BRPL approval and integration with HES.
9.3	Base computer software	Licensed Software with the following features should be supplied for free to download meter through optical port.
9.3.1	Operating System	BCS should be compatible for latest Windows operating system.
9.3.2	Security	System shall be password protected where user can login only if login ID is provided by administrator. BCS shall have rights management system so that access rights can be provided as per requirement to maintain security.
9.3.3	Database	BCS shall maintain master database according to desired area, location, and region etc.
9.3.4	Reporting	a. BCS shall have option of user defined report generation in format of Excel, Word and CSV, XML, PDF etc. b. BCS shall have capability to export data in ASCII, CSV and XML format at desired location so that the same could be integrated with our billing data for processing. c. All the data available in the meter shall be convertible to user defined ASCII, CSV and XML file format.

9.3.5	Data transfer rate	BCS and communication ports should support data transfer rate of 9600 bps (minimum).
9.4	Hand Held Unit Software	a. The manufacturer has to provide software capable of downloading all the data stored in meter memory through window/ android operating system based handheld units (HHU) through optical port. b. In the event of order, bidder shall work with BRPL IT team/ BRPL designated system integrator to develop HHU software for meter downloading and further uploading on HES. c. HHU software should have option for selection of parameters to be downloaded from meter. d. Meter data consisting of all parameters and complete load survey for all parameters shall be read by HHU and downloaded on HES in minimum possible time (not more than 5 minutes).
9.5	Training	Manufacture shall impart training to BRPL personnel for usage of software

10. Name Plate

SN	Description
10.1	Meter Serial number shall be of 8 digits. Serial number shall be printed in black colour. Embossing is not acceptable.
10.2	Size of the digit shall be minimum 5X3mm
10.3	Bar code shall be printed along with serial number
10.4	BIS registration mark (ISI mark)
10.5	'BRPL' insignia shall be printed above LCD display.
10.6	BRPL PO No. & date
10.7	Manufacturers name and country of origin
10.8	Model type / number of meter
10.9	Month and Year of manufacturing
10.10	Reference voltage / current rating
10.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
10.12	Meter constant
10.13	Class index of meter
10.14	Reference frequency
10.15	Warranty period
10.16	Communication technology with carrier frequency
10.17	Name plate of NIC a. Serial no of NIC along/ IMEI no/MAC address with bar code

	b. Name of purchaser's c. Communication technology with carrier frequency d. Manufacturing year and month. e. Warranty period.

11. Component Specification

SN	Item	Description	Make
11.1	Current Transformers	The Meters should be with the current transformers as measuring elements.	To meet accuracy requirement
11.2	Measurement or 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, Atmel, Phillips, SAMES ,NEC,TEXAS
11.3	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Texas Instruments, Phillips, ST, Hitachi, Compiled
11.4	Display modules	a. The display modules should be well protected from the external UV radiations. b. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). c. It should be STN type industrial grade with extended temperature range min 70 ºC.	Hongkong: Genda Singapore: Bonafied technologies Korea: Advantek China: Success Japan: Hitachi, Sony
11.5	Optical port	The mechanical construction of the port should facilitate the data transfer. Communication shall not disturbed by external light.	USA: National Semiconductors, HP Holland/ Korea: Phillips Japan: Hitachi, Ligitek
11.6	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 in case the maximum voltage of the system appears to the terminals due to faults or due to wrong	SMPS Type

		connections.	
11.7	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes. The PTH components should be positioned such a way that the leads of components should not be under stress and not touching the internal wires.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments. Japan: Hitachi, Oki, AVX or Ricoh Korea: Samsung
		LED	Everlight, Agillent
11.8	Mechanical parts	a) The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
11.9	Battery	Lithium with guaranteed life of 15 years	Texcell, SAFT, Varta, Tedirun, Sanyo
11.10	RTC & Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips, Dallas Atmel, Motorola, Microchip, TEXAS, Japan: NEC, Oki
11.11	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	(BBT test is must)
11.12	Note	a. The components used by manufacturer shall have "Minimum Life" more than the 10 years. b. Incase vendor want to use other make components; same shall be approved by BRPL before use. c. Even for existing supplier – fresh approval is needed for all deviations. d. Manufacturer should have complete tracking of material used in meter. BRPL reserve the	

		right to carry out audit of inventory/ manufacturing process at manufacturer's works and sub vendor's work.	

12. Quality Assurance, Inspection and Testing

SN	Item	Description
12.1	Vendor's Quality Plan (QP)	To be submitted for Purchaser's approval.
12.2	Sampling Method	Sampling Method for quality checks shall be as per relevant IS/ IEC/ CBIP guidelines and Purchaser's prior approval shall be taken for the same.
12.3	Inspection Hold-Points	To be mutually identified, agreed and approved in Quality Plan.
12.4	Type Tests	a. The meter shall be of type tested quality including all tests specified in this specification which are beyond IS / IEC or CBIP. b. Type test conducted from CPRI/ ERDA/ or any other lab specified by BIS/ CEA for smart meter testing will be treated as valid. c. Type test certificate should be submitted along with offer for scrutiny. d. Any other component supplied in addition to meter shall also be type tested as per IS /IEC if applicable. e. Complete type test as per IS 16444 (Part 2) shall be carried out on sample selected from BRPL lot.
12.5	Routine tests	All test marked "R" as per table 20 of IS 14697.
12.6	Acceptance Tests	a. All tests marked "A" as per table 20 of IS 14697. b. Smart meter functional tests as per IS 16444 Table 1 c. Test of load switch as per clause 10.4 of IS 16444 (Part 1) d. Test for data exchange protocol as per clause 10.5 of IS 16444. e. Test for Smart meter communicability as per clause no. 10.6 of IS 16444 (Part 1). f. All the routine and acceptance tests shall be carried out as per relevant standards. g. Following tests in addition to IS shall be conducted during lot inspection. I) Dimensional and drawing verification. II) Display parameters/ sequence. III) Data Downloading from CMRI and PC.

		IV) Tamper/ fraud detection/logging features as per approved documents. Tamper conditions will be simulated at varying load up to Imax. Accuracy will also be checked during tamper simulation. V) Burn in chamber test. VI) Component verifications. h. Purchaser reserves the right to formulate any other test method to verify guaranteed parameters of Meter.
12.7	ESD and Magnetic Interference test	ESD and magnetic interference test will be conducted at Samir lab, Chennai or CPRI.
12.8	Inspection	a. Purchaser reserves the right to inspect /witness all tests on the meters at Seller's works at any time, prior to dispatch, to verify compliance with the specification/ standards. b. Manufacturer should have all the facilities/ equipments to conduct all the acceptance tests as per clause 14.3 relevant standards and tampers logics as per approved GTP. All the equipments including tamper logs kits/ jigs should be calibrated. c. In-process and / or final inspection call intimation shall be given in advance to purchaser.

13. Packing, Marking, Shipping, Handling and Storage

SN	Item	Description
13.1	Packing	a. Each meter must be packed, together with its terminal cover, in a separate environmental friendly cardboard box, which can be opened and re-closed without needing adhesives. b. Up to 4 to 5 three-phase meters must be packed together with their terminal covers in a group cardboard box, which can be opened and re-closed without needing adhesives. c. The box shall prevent, as much as possible, penetration of dust during long storage periods. The box must be designed for multiple use and be robust, with wall thickness of at least 4 mm. d. Maximum weight of a group meter box shall not be more than 25 Kg. e. The packaging will protect the meters against shock and vibration, preventing damage due to the road conditions during transport and distribution in the field. The electrical and mechanical properties shall not be

		affected by these disturbances. f. For shipping the boxed meters will be close packed by stockpiles of suitable quantities on pallets. The meters numbers sequence (without partition) shall be kept in each pallet. A pallet will be protected against moisture by a polyethylene hood, covered with a cardboard cover (hood), and fixed onto the pallet by parallel polypropylene bands, using protection angle bars at the corners. The hood shall be marked – on the front (wide side), on the narrow side and on the top as per clause 13.3. g. Each pallet should contain between 70 and 300 meters. The actual number of meters on each pallet will be agreed with the BRPL in the event of order. h. An impact detector ("Shock-Watch") label shall be attached to the cardboard hood of several pallets in each container/ transport truck, to warn of possible rough handling during shipment, transport and storage.
13.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label.
13.3	Marking	On each group box and pallet, following details are required both on front (wide side) and top: a. BRPL logo. b. Meter serial number range along with bar code. c. Unique number of box/ pallet. d. Purchaser's name e. PO number (along with SAP item code, if any) & date with bar code f. Equipment Tag no. (if any) g. Destination h. Manufacturer / Supplier's name i. Address of Manufacturer / Supplier / it's agent j. Type , rating and other description of equipment k. Country of origin l. Month & year of Manufacturing m. Case measurements n. Gross and net weights in kilograms o. All necessary slinging and stacking instructions
13.4	Test reports	Routine test report to be provided with each meter
13.5	Shipping	The seller shall be responsible for all transit damage due to improper packing.

13.6	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet /manual to be furnished before commencement of supply.

14. Deviations

SN	Item	Description
14.1	Deviations	a. Deviations from this specification can· be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. b. In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.

15. Drawing Submission

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

SL	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Tamper Sheet	Required	Required	
4	Display Parameters	Required	Required	
5	GA / cross sectional drawing of Meter showing all the views / sections	Required	Required	
6	Detail of network interface i.e. pin out, standard, voltage level etc and its integration requirement.	Required	Required	
7	Samples of each type and rating offered along with box and RF NIC/ communication module of already integrated RF card as per tender qualifying criteria.	2 no's	1 no's	
8	Any software and accessories required for installation/ operation of meter	Required	Required	
9	Manufacturer's quality assurance plan and certification for quality standards	Required		
10	Type Test reports of offered model/ type/ rating	Required		
11	BIS certificate	Required		
12	Complete product catalogue and user manual.	Required		

13	Customer Reference List	Required		
14	Recommended list of spare and accessories	Required		
15	Specification documents containing all parameters, Services, Methods in addition to companion specification of IS 15959 (part 2).		Required	
16	Program for production and testing (A)		Required	Required
17	Makes of components		Required	Required
18	Detailed installation and commissioning instructions		Required	Required
19	As Built Drawing		Required	Required
20	Operation and maintenance Instruction as well as trouble shooting charts/ manuals		Required	Required
21	Inspection and test reports, carried out in manufacturer's works			Required
22	Routine Test certificates			Required
23	Test certificates of all bought out items			Required
24	Meter Seal data			Required
25	Mapping of meter serial no to Communication card.			Required

16. Delivery

16.1	Delivery	Despatch of Material: Vendor shall despatch the material, only after the Routine Tests/Final Acceptance Tests (FAT) of the material witnessed/waived by the Purchaser, and after receiving written Material Despatch Clearance (MDC) from the Purchaser.

Annexure – A: Guaranteed Technical Particulars

Bidder shall furnish the GTP format with all details against each clause of this specification.
Bidder shall not change the format of GTP or clause description.
Bidder to submit duly filled GTP in hard copy format with company seal.

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

Bidder / Vendor seal / signature ----------

Name of the bidder	
Address of the bidder	
Name of contact person	
Telephone number and email id	

Annexure – B: Recommended Accessories / Spares

SL	Description of spare part	Unit	Quantity
1		No	
2		No	
3			

Annexure – C: Integration Requirement of Meters with NIC and HES

Integration requirements with communication provider of BRPL/ any other agency designated by BRPL for other components of AMI.

a. Bidder(s) must share the meter security keys, all level encryption, and password information along with asset information in a format with the buyer / communication provider of BRPL so that during AMI business flow, the device and data can be authenticated all the time.
b. Bidder(s) must share the details of meter communication specifically programmed protocols.
c. Bidder(s) must share the meter configuration source code to the BRPL/ communication provider of BRPL.
d. Bidder (s) must share the meter interface touch points for external applications/ systems.
e. Bidder(s) must share the required APIs including but not limited to reading APIs, configuration APIs and Functional APIs with the System Integrator for execution of business flow (Installation, reading, configuration).
f. Bidder(s) must share the data storage and retrieval details.
g. Bidder(s) must configure the devices to be upgraded remotely (OTA) and share the required firmware source code (with updates over the project life) with system integrator as and when it is required in case of feature request or fault correction.
h. Bidder(s) must follow and conduct Utility's sample and periodic test program, including (but not limited to) the selection of a sample population of meters, sharing of sample test results as reported by the meter testing systems with the system Integrator.
i. Bidder(s) must share the information related to communication module for the authorization purpose at to BRPL/ communication provider of BRPL.

Annexure – D: Tamper and Fraud Detection/ Events

1. Voltage Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
R Phase Voltage Missing (Occurrence/ Restoration)	Absence of potential on any phase should be logged. Restoration of normal supply shall also be recorded. The threshold value of voltage should be programmable at factory end	Occurrence: If Vpn<10% Vref and Ip>10% Ib Restoration: If Vpn>=10% Vref and Ip>10% Ib	Occurrence: 5 Min Restoration: 5 Min
Y Phase Voltage Missing (Occurrence/ Restoration)			
B Phase Voltage Missing (Occurrence/ Restoration)			
Over Voltage (occurrence/ restoration)	Meter should log high voltage event if voltage in any phase is above a threshold value.	Occurrence: If Vpn>10% Vref Restoration: If Vpn<=10% Vref	Occurrence: 5 Min Restoration: 5 Min
Low Voltage (occurrence/ Restoration)	Meter should log low voltage event if voltage in any phase is below a threshold value. Threshold value if factory programmable.	Occurrence: If Vpn<75% Vref Restoration: If Vpn<=75% Vref	Occurrence: 5 Min Restoration: 5 Min
Voltage Unbalance (Occurrence/ Restoration)	Meter should log voltage imbalance event when the difference between minimum and maximum phase voltage is more than a threshold value. Threshold value should be factory programmable.	Occurrence: If Vmax-Vmin>30% Vref Restoration: If Vmax-Vmin<=30% Vref	Occurrence: 5 Min Restoration: 5 Min
R Phase high Voltage Harmonics	Meter should log occurrence of high voltage harmonic event when % THD in voltage of phase will be more than threshold value. Threshold value should be	Occurrence: If % THD in Vpn>5% of fundamental. Restoration: If % THD in Vpn<5% of fundamental.	Occurrence: 5 Min Restoration: 5 Min
Y Phase high Voltage Harmonics			

B Phase high Voltage Harmonics	factory programmable.		
2. Current Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Current Reverse/ R Phase Current Reverse (occurrence/ Restoration)	Meter should log the event of reversal of C.C polarity. Meter should register energy consumed correctly with any one, two or all three current coils reversed. This event shall not be valid in bidirectional mode of metering.	Occurrence: If Ip = -ve direction Restoration: If Ip=+ve direction	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Reverse (occurrence/ Restoration)			
B Phase Current Reverse (occurrence/ Restoration)			
R Phase Current Open (Occurrence/ Restoration)	Meter should log the event of current coil open. Threshold value of current should be programmable at factory end.	Vector Sum($I_R+I_Y+I_B+I_N$)>20% Ib *and I<10% Ib* *Vector* *Sum($I_R+I_Y+I_B+I_N$)>20% Ib*	Occurrence: 5 Min Restoration: 5 Min
Y Phase Current Open (Occurrence/ Restoration)			
B Phase Current Open (Occurrence/ Restoration)			
Current Unbalance (Occurrence/ Restoration)			
Current Bypass (Occurrence/ Restoration	Meter should log the event of current coil shorting/bypass. Threshold value of current should be programmable at	Vector Sum($I_R+I_Y+I_B+I_N$)>20% Ib *and I (any Phase) >5% Ib* *Vector*	

	factory end.	*Sum(I_R+I_Y+I_B+I_N)>10% Ib*	
Over current (occurrence/ restoration)	If the current in any phase exceeds the specified threshold current, meter should log over current event.	Occurrence: If Ip>Imax Restoration: If Ip<=Imax	Occurrence: 5 Min Restoration: 5 Min
R Phase high Current Harmonics R Phase high Current Harmonics R Phase high Current Harmonics	Meter should log occurrence of high voltage harmonic event when % THD in voltage of phase will be more than threshold value. Threshold value should be factory	Occurrence: If % THD in I_P>5% of fundamental. Restoration: If % THD in I_P <5% of fundamental.	Occurrence: 5 Min Restoration: 5 Min
High neutral Current	Meter should log event of high neutral current if measured neutral current should be more than predefined threshold value.	Occurrence: If I_N> 50% of average phase current Restoration: If I_N< 50% of average phase current	Occurrence: 5 Min Restoration: 5 Min
Difference between actual and calculated neutral Current	Meter shall log the event if measured neutral current has been found differ from calculated neutral current from a predefined value	Occurrence: If $\|I_{N(calculated)}$-$I_{N(measured)}\|$>*10% of Ib.* Restoration: If $\|I_{N(calculated)}$-$I_{N(measured)}\|$<=*10% of Ib.*	Occurrence: 5 Min Restoration: 5 Min
3. Power Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Power OFF (occurrence/ restoration)	Meter shall detect power OFF if all phase voltages are absent. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded.		
Abnormal Power Off (Occurrence/ restoration)	If meter micro detect power off whereas phase voltage is present than abnormal power will be recorded. Meter sall continue to record energy as	Occurrence: If voltages at meter power supply<10% Vref and Vp>20% vref. Restoration:	NA

	per phase voltage and current.		
Sudden load Change	Meter shall log event if there is sudden change in load e.g. 40% of last measured value.		
4. Other Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values**	**Persistence Time**
Abnormal External Magnetic Influence (Occurrence/ Restoration)	a. Meter should either be immune or should log the events of attempt of tampering by external magnetic field as per relevant IS14697/ CBIP 325 with latest amendments. b. If the working of meter gets affected under the influence of external magnetic field, meter should record energy at Imax. Meter should not compute MD during this period. The meter shall record energy as per actual load once the magnetic field is removed.	As per IS 14697/ CBIP 325	As per IS 14697
Neutral Disturbance- HF, DC and Alternating (occurrence/ restoration)	Meter should log the event when AC/DC/ Pulsating voltage is injected in neutral circuit.	As per manufacturing standard.	Bidder shall define threshold values
Low Power Factor	Meter shall able to detect and log the low PF event if power factor of the load found in between 0.2 to 0.5 for a load above than a % threshold value for a threshold time value. Event shall restore if PF factor of		10% of I basic

	load remain out of range 0.2 to 0.5 for a load above than % threshold value for		
Plug in Communication module removal (Occurrence/ Restoration)	Meter should log the removal of communication card. Meter should also log insertion of communication card.	By NC switch/ sensor	
Configuration change to post-paid mode/ pre-paid mode	Meter should log the change in payment mode configuration.		
Configuration change to "Forwarded" only" mode/ "Import and Export" mode	Meter should log the change in metering mode configuration.		
Overload (Occurrence/ Restoration)	Meter should able to log the status of overload in KW		
HV Spark (Occurrence/ restoration)/ Jammer	Meter with communication card should be immune or log the event in the case of application of ESD upto and including 35 KV.	Immediately	NA
DO alarms	Meter shall log DO alarms as configured by user	NA	NA
Distorted PF	Meter shall log the event if difference between displacement PF and actual PF is more than a predefined value		Occurrence: 5 Min Restoration: 5 Min
Time Based Event Stamp	Meter shall log voltage, current, PF and energy consumption on a predefined time	As per predefined time	NA
5. Non Roll over events:			
Event Description			

Occurrence of cover open
6. Transaction Related Events:
Detail of Transaction
Real Time Clock- Date and Time
Demand Integration Period
Profile Capture Period
Single Action schedule for billing date
Activity calendar for time zones
New firmware activated
Load Limit (KW) Set
Enable Load Limit Function
Disable load limit function
LLS secret (MR) change
HLS key (US) change
HLS key (FW) change
Global key change
ESWF change
MD reset