Appendix 4: Technical Specifications for DT Smart Meters

1.0 Scope of Supply

This specification covers the design, manufacture, assembly, inspection, testing and delivery of supply of Accuracy Class 0.5S (Active & Reactive), 3 x 240 V and 5-10 A static smart energy meter for DT with plug in communication module (Cellular (4G/NBIOT) and accessories required for successful operation of the meter.

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.

2.0 Codes & 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 3)	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-	Local data transmission profiles for Local Networks (LN)

	5:2016	
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.	

3.0 Service Conditions

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 %

4.0 Distribution System Data

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

5.0 Electrical and Accuracy Requirement

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	Power factor range	Zero lag – Unity – Zero lead
5.6	Starting current	0.1 % of base current
5.7	Rated Frequency	50Hz +/- 5%
5.8	Accuracy Class	0.5s (IS14697 applies for accuracy requirements)
5.9	Power Consumption	As per IS 16444 (Part 2) Meter with lowest power consumption shall be preferred.
5.10	Meter constant	Imp/ unit (Bidder to specify meter constant)
5.11	Calibration	Meter shall be software calibrated at factory and modification in calibration shall not be possible at site by any means or external influence.
5.12	Test Output Device	Separate kWh & kVAh/kVArh Flashing LED visible from the front
5.13	Process Technology	Surface Mounting Technology or better
5.14	Insulation Level	Meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
5.15	Influence of supply voltage	As per IS 14697
5.16	Short time over current	As per IS 14697
5.17	Immunity to phase and earth fault	As per IS 14697
5.18	Influence of Self Heating	As per IS 14697
5.19	Influence of Heating	As per IS 14697

5.20	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
5.21	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: BSES reserves the right to formulate any other test method to check magnetic immunity/ logging of meter. Meter with logging provision will be preferred.
5.22	Other features	Mid night data: The meter should record midnight Cumulative kWh & kVAh, kVARh lag and kVARh lead reading for last min 45 days load survey data. Total Harmonic Distortion: Meter to record harmonic components in both current and voltage circuits. And should be available in on demand display. Meter to record events in case harmonic component in both V&I if it exceeds threshold limits (configurable).
5.23	Display Sequence for the parameters	Default Display (Auto Mode) i. LCD test ii. Meter serial no. iii. Date iv. Real time v. Cumulative kWh vi. Cumulative Export Active Energy* vii. Net Active energy* viii. Cumulative kvarh Q1/Lag ix. Cumulative kvarh Q2/Lead x. Cumulative kvarh Q3* xi. Cumulative kvarh Q4* xii. Cumulative kVAh xiii. Cumulative Apparent Energy (active export)* xiv. Net Apparent energy* xv. Instantaneous load in kW, kVArh & kVA xvi. TOD MD for kWh and kVAh xvii. Phase wise voltage and current (R, Y, B phases) xviii. Power factor xix. Neutral current xx. TOD Total Active Forward Energy Register(Reg 1) xxi. TOD Total Active Forward Energy Register(Reg 2) xxii. TOD Total Active Forward Energy Register(Reg

		3) xxiii. TOD Total Active Forward Energy Register(Reg 4) xxiv. TOD Total Active Forward Energy Register(Reg 5) xxv. TOD Total Active Forward Energy Register(Reg 6) xxvi. TOD Total Active Forward Energy Register(Reg 7) xxvii. TOD Total Active Forward Energy Register(Reg 8) xxviii. TOD Apparent Forward Energy Register(Reg 1) xxix. TOD Apparent Forward Energy Register(Reg 2) xxx. TOD Apparent Forward Energy Register(Reg 3) xxxi. TOD Apparent Forward Energy Register(Reg 4) xxxii. TOD Apparent Forward Energy Register(Reg 5) xxxiii. TOD Apparent Forward Energy Register(Reg 6) xxxiv. TOD Apparent Forward Energy Register(Reg 7) xxxv. TOD Apparent Forward Energy Register(Reg 8) xxxvi. Temperature xxxvii. Total tamper count xxxviii. Status of communication module xxxix. Mode (Net/Forward) xl. Signal strength in RSSI i. Error code Display (On demand) After using pushbutton the following parameters should be displayed. ii. LCD test iii. Meter serial no. iv. Date v. Real Time vi. Cumulative kWh vii. Cumulative Export Active Energy* viii. Net Active energy*

		ix.	Cumulative kvarh Q1/Lag
		x.	Cumulative kvarh Q2/Lead
		xi.	Cumulative kvarh Q3*
		xii.	Cumulative kvarh Q4*
		xiii.	Cumulative kVAh
		xiv.	Cumulative Export Apparent Energy*
		xv.	Net Apparent energy*
		xvi.	Current MD in kW
		xvii.	Current MD in kVA
		xviii.	MD in kVAR
		xix.	TOD MD for kW and kVA
		xx.	TOD MD occurrence for kW and kVA
		xxi.	Instantaneous Power factor
		xxii.	Instantaneous voltage R phase
		xxiii.	Instantaneous voltage Y phase
		xxiv.	Instantaneous voltage B phase
		xxv.	Instantaneous current R phase
		xxvi.	Instantaneous current Y phase
		xxvii.	Instantaneous current B phase
		xxviii.	Last month billing Date
		xxix.	Last month billing kWh reading
		xxx.	Last month billing kVARh reading
		xxxi.	Last month billing kVAh reading
		xxxii.	Last month billing Maximum Demand in kW
		xxxiii.	Last month billing Maximum Demand in kW occurrence Date
		xxxiv.	Last month billing Maximum Demand in kW occurrence Time
		xxxv.	Last month billing Maximum Demand in kVA
		xxxvi.	Last month billing Maximum Demand in kVA occurrence Date
		xxxvii.	Last month billing Maximum Demand in kVA occurrence Time
		xxxviii.	THD for both Voltage and Current
		xxxix.	Total Active Energy, Apparent Energy
		xl.	Fundamental Reactive Lag and Fundamental

		Reactive Lead Energy xli. High Resolution value (kWh, KVAh) xlii. High resolution Export Active Energy (kWh , KVAh)* xliii. Neutral Current xliv. Temperature xlv. Battery status xlvi. PT/CT status xlvii. Self diagnostic flag xlviii. Connection check (Phase sequence) xlix. Cumulative Tamper count xli. Cumulative Power off hours xlii. Signal strength in RSSI l. Error code li. Phase association (ok/ Not ok) * When meter is configured in net metering mode then only these parameters should appear otherwise these display parameters should be disable and shall not appear on display Note: 1. The meter display should return to Default Display mode (mentioned above) if the 'push button' is not operated for more than 6 seconds. Provision for scroll lock by pressing for 15 sec and sent to normal after 5 minutes. 2. Sequence of display parameter and parameter subject to change and to be finalized before supply.

6.0 Construction

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.

		c. Top cover should be designed so as the internal components should not be visible.
6.3	Terminal Block	a. Material - Flame retardant glass filled polycarbonate of grade 500 R or equivalent. b. Terminal block shall form Integral part of the meter base c. 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 of grade LEXAN 143A/943AA or equivalent. 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 grub 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' may 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 51 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. HES will sync RTC at least once a day (configurable).
6.10	Battery	a. 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. b. Meter should have two separate battery . c. One for RTC and one for back up d. Incase battery voltage reduced below threshold value then need to generate alert
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	a. Meter should have the provision for 01 no's modular and pluggable communication module compatible with Cellular (4G Or NBIOT). b. Meter shall have mechanism to log communication module removal and insert as an event in its memory with date and time stamp. c. Meter shall have separate indications on display/ for remote and local communication. d. Communication module shall held in a casing which can be directly plugged in the meter. Sealing screw shall be provided.
6.15	First breath and last gasp	a. In Last Gasp endpoint shall send the power outage and power restoration 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).
6.15	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	Manufacturer's Seals	a. Sealing should be as per CEA metering regulation and relevant IS. 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).

6.16.1	BSES Seals	a. BSES will provide the seal (s) which need to put by manufacturer as per BSES SOP. b. Seals will be issued to manufacturer free of cost.
6.16.2	Seal record	Record of all seals shall be forwarded to purchaser with each lot.
6.16.3	Insulation	A meter shall withstand an insulation test of 4 KV and impulse test at 8 KV
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. "DT Meter" should be BOLDLY marked on name plate. Design of Name plate will be approved by BSES. d. Name plate shall have QR code having meter information like meter s.no., month and year of manufacturing, type of meter, OEM, Rating etc e. NIC firmware version shall be available in name plate read out profile in addition to parameters mentioned in table A26 of IS:15959 f. 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. 126 months from the date of dispatch or 120 months from date of commissioning, whichever is earlier b. The meters which are found defective/inoperative within the guarantee period shall be replaced as per meter service level agreement.

7.0 Functional Requirement

7.1	Meter category	Smart meter comply with D4 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. 7.3. b. Bidirectional: Both Import and export energy recording shall be applicable in this mode of metering and relevant registers shall be updated. c. Any change in metering mode shall be logged in events with date and time stamp. d. Default mode of metering shall be forwarded only untill specified in tender requirement otherwise.
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. It should be possible to reset MD automatically at the defined date (or period) or through CMRI
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 BSES 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. % 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. Temperature i. Signal Strength in RSSI j. Voltage angles 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. 12 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. d. Cumulative power interruption count in all monthly history data e. Monthly Power off duration in all history data.
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 45 Power ON days for 30min IP. 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 Phase wise Voltage and Current (Line, Active, Reactive) with instant and average value. all three phase active, reactive (lag and lead) and apparent power and energy power-off time integration period Neutral 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 45 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 ’25’ of IS 15959 (Part 3).
7.10.2	Association Rights	As per clause no. 26.1 of IS 15959 (Part 3)
7.10.3	Programmable parameters	These parameters can be programmed remotely by HES and locally by HHU 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 as mentioned in specification
7.10.4	Association rights	As per Clause no. 26.2 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 successfully, meter shall send an acknowledgment to HES. It shall also log it as an event in its memory with date and time stamping. 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 h. Meter shall support auto resume firmware upgrade in case file transfer stops due to any reason like power supply failure. There shall not be any corruption in data during transfer of firmware. i. In case of wrong firmware file, meter shall be able to identify the same and suspend FOTA activity j. Meter shall support NIC FOTA through HES k. NIC firmware file size should be less than meter firmware file
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. Updating of Programmable parameters
7.14	Security	a. Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided. b. Reading and writing data into meter memory via optical and remote communication port shall be through DLMS security keys only. c. Bidder shall ensure to safeguard high security keys used for configuring parameters into meter. d. Once the meter memory is locked during manufacturing process, only parameters mentioned in IS 15959 shall be configurable even in factory. It should not be possible to configure any other parameters. e. Please note that there shall be no other mechanism/ method to interface with meter through optical and remote communication port except mentioned in IS 15959, even for manufacturer. f. It should not be possible to change data stored in meter memory even after accessing meter memory physically. In case of any change in memory data, a flag/alert shall be generated. Flag/Alert shall be indicated over display and in remote communication also
7.15	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
7.151	Encryption/ Authentication for data transport	As per clause 7.2 of IS 15959 (Part 2)
7.15.2	Key requirement and handling	As per clause 7.3 of IS 15959 (Part 2)
7.15.3	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 local 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 unsuccessful attempts are allowed, after which the port is locked out until authenticated from system administrator.
7.15.4	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	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	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 Push Services: Read Only for identified events as per ESWF
7.18	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

		Control Events
7.18.1	Compartments of events Parameter Snapshot	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' g. For each occurrence event captured, the cumulative tamper count shall be incremented. h. Meter shall capture all the parameters mentioned in table ‘24’ of IS 15959 (part 3) when event occurrence and restoration is logged
7.18.2	Event Logging	The meter shall log minimum 200 tamper events (ensuring at least 20 events for each tamper).
7.18.3	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
7.18.4	Phasor Representation	Meter shall support parameters required to develop phasors of current and voltage at HES.
7.19	Harmonic Energies	All the energies measured and recorded with and without harmonics.
7.20	Additional feature (Mandatory)	a) Meter should measure Voltage between Earth and Neutral and for the same have an additional terminal which can be connected to earth potential. The VNE can be part of inst parameter group. b) When ever meter experiences a sudden change in load i.e. sudden reduction by 30%, it should log last 10 such events.
7.21	Digital Output (DO),	a) Meter should have 2 no. of Digital Output (DO) ports

	Digital Input (DI) , Analog Input (AI)	to remotely connect/ disconnect the load via suitable mechanism. b) Meter should have 2 no. of Digital Input (DI) and 2 no. of AI ports for measurement of various sensor parameters like ambient temperature, oil temperature, oil level etc.

8.0 Meter Display

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 10X6mm PIN Type
8.4	LCD Digits	Total 10 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.

9.0 Data and communication protocol/ HES/Integrations/ Software

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 BSES IT team/ BSES designated system integrator to integrate its meter with BSES HES system. b. Bidder shall prepare detailed documents as mentioned in above clause and submit it for BSES 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 BSES IT team/ BSES 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 BSES personnel for usage of software

10.0 Name Plate

10.1	Meter Serial number shall be of 10 digits. Serial number shall be printed in black colour. Embossing is not acceptable.
10.2	Size of the digit shall be minimum 5 X 3mm. Details shall be printed by laser printing preferably.
10.3	Bar code shall be printed below the serial number
10.4	BIS registration mark (ISI mark)
10.5	'BSES' insignia shall be printed above LCD display.
10.6	BSES PO No. & date and Property of BSES
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 Impulse/kWh Impulse/kVAh/kVArh
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.

11.0 Component Specification

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

12.0 Quality Assurance, Inspection and Testing

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 BSES 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.
12.8	General Requirements	**a)** The internal potential links should be in closed position or link less meters will be preferred and there shall not be any external link. **b)** Deliverable with Meters. i. Hard copies for Routine test certificates with each meter till alternate is provided by vendor and approved BSES. ii. Terminal cover should be fixed on the meter before dispatch.

		iii. Report of seal & initial reading record. (soft copy as per BSES format) **c)** Box number, meter serial number, type, rating should be mentioned on cases / cartons. **d)** Meters shall be suitably packed with environmental friendly material in order to avoid damage or disturbance during transit or handling and to prevent in grace of moisture and dust. Also refer CEA Metering Regulation 2006. **e)** In case battery removal/ total discharge same should not affect the working & memory of the meter. **f)** The bidder shall maintain a web site where routine test results of all meter supplied against these tender will be maintained and will be accessible to buyer/ buyer representative. **g)** The supplier shall give 15 day advanced intimation to enable BSES to depute representative for lot inspection. **h)** Vendor shall ensure that patch required for HHU/CMRI shall be provided within 4 weeks. Vendor shall also ensure to deliver solution to meet DERC mandate within mutually agreed timeline. **i)** Delivery of software for reading through HHU/CMRI before meter delivery is required. **j)** For any false events recorded in meter, vendor shall depute their representative for field visit within one week and provide the root cause analysis in 4 weeks time.

13.0 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. Visual indications (stickers) 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. BSES 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.

14.0 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. c. Refer Annex C for deviation

15.0 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 communication.	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
26	Other documents:	Required	Required	

	a. Completely filled-in Technical Parameters b. General arrangement drawing of the meter c. Rating plate d. Terminal Block dimensional drawing e. Mounting arrangement drawings f. Meter box drawing and dimensions g. Display parameter h. PIN configuration of Optical to RJ11 connector i. Manual and SOP/DWI for operation			

16.0 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- Deviation Sheet

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

Annexure - D- Tamper and Fraud Detection/ Events

1. Voltage Related Events:			
Description of event	**Logic Of Event**	**Logic Expression/ Threshold values (Configurable)**	**Persistence Time (Configurable)**
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 (Configurable)**	**Persistence Time (Configurable)**
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) Y Phase Current Open (Occurrence/ Restoration) B Phase Current Open (Occurrence/ Restoration)	Meter should log the event of current coil open. Threshold value of current should be programmable at factory end.	Occurrence :Vector Sum($I_R+I_Y+I_B+I_N$)*>20% Ib and I<10% Ib* Restoration *: Vector Sum($I_R+I_Y+I_B+I_N$)< 20% Ib and I>5% Ib*	Occurrence: 5 Min Restoration: 5 Min
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 and also configurable through HES.	Occurrence : Vector Sum($I_R+I_Y+I_B+I_N$)*>20% Ib and I (any Phase) >5% Ib* Restoration *: Vector Sum ($I_R+I_Y+I_B+I_N$)<20% Ib and I (any Phase) > 5% 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 (Configurable)**	**Persistence Time (Configurable)**
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 (Configurable)**	**Persistence Time (Configurable)**

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 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 “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 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	As per predefined time	NA

	predefined time		
Temperature	If temperature is more than 60deg C. Meter has to log as an event and sent alert	-	-

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 BSES specification/ IS 155959 (part 2). Approval shall be taken from BSES 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.