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TECHNICAL SPECIFICATIONS
FOR
INTELLIGENT POWER DISTRIBUTION BOX COMPRISES OF DISTRIBUTION TRANSFORMER OF 3/5
KVA RATING, CONSUMER METERING, CONTROLLING AND COMMUNICATION SYSTEM TO BE
USED IN DISTRIBUTION NETWORK FOR LOSS REDUCTION IN SPECIFIC AREA OF UGVCL

:: TECHNICAL SPECIFICATIONS::

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1.0 GENERAL:-

- 1.1 All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable IS/IEC standards.
- 1.2 Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted.
- 1.3 The electrical installation shall meet the requirement of Indian Electricity Rules-1956, CEA safety Regulation 2010 as amended up to date; relevant IS a code of practice and Indian Electricity Act-1910/IE Act-2003Also, other rules, and regulations applicable to the work shall be followed. In case of any discrepancy, the most stringent and restrictive one shall be binding.

2.0 SCOPE OF WORK:-

- 2.1 The Bidder shall execute the work on TURNKEY basis. The scope of this contract includes but not limited to design, engineering, manufacturing, assembling, inspection & testing at manufacturer's works, supply, delivery at the site, and successful commissioning intelligent power distribution boxes& necessary hardware, software with complete Remote Metering System as mentioned hereunder.
- 2.2 The Metallicintelligent power distribution consolecomprises of single-phase air-cooled dry type distribution transformer of 3KVA/ 5KVA rating, 1.1/0.240 KV No Load Voltage ratio, a compartment for 03+01/05+01 Nos. A. C. Single-phase two-wire,whole current 5-30 Amperes electronics energy meters,High-quality Single pole single throw latching relays forprogrammable automatic and remote disconnection facility, One no of IoT Based DCUconsisting of device communication interfaces (inputs/ outputs), microprocessor, data storage, remote communication and auxiliary features as per detailed specification,Neccesory Power Terminal Blocks., Remote Energy Backlit type Display Units, , Plug and Play type terminal block facility for outgoing 2 core power and control cable and required auxiliary components.
- 2.3 The Intelligent Power Distribution consoleis to be installed on the LT Pole of the Power Distribution Network of the utility. The Intelligent Power Distribution box enclosure shall have two separate compartments each for transformer and consumer metering &controlling beeach compartment shall have its separate door fitted with hinges and clamps. However, there shall be only the locking arrangement of the compartment.
 - 2.3.1 Transformer Compartment: A compartment for the installation of one single-phase,1.1/ 0.240 KV, either 3 OR 5 KVA transformer as per technical specifications, Natural Air-cooled (AN) Type Distribution transformer with Louvers and other air natural cooling facility as per enclosed drawing.

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- 2.3.2 Metering Compartment: One compartment for the housing of 03+01 OR 05+01 Nos, 1 Phase-2 Wire electronics energy meters for consumer metering, IoT-based DCU, single pole single throw latching relays, Power terminal blocks, and other required accessories associated with low voltage power distribution circuit.
- 2.4 The scope also covers installing and commissioning the display unit in the consumer premises for each consumer supplied through this power distribution arrangement. As per the GERC regulation, it is mandatory to facilitate each consumer to avail for its energy meter electrical parameters recorded in the electricity meter. The installation, interconnection, and testing of remote display with a single-pole MCB SMC box enclosure at consumer premises shall be in the scope of the bidder.
- 2.5 Supply of all such accessories/parts which are useful and necessary for its electrical, electronic and mechanical safe operation deemed to be within the scope of this technical specifications, whether specifically mentioned or not
- 2.6 The supply of single-phase consumer tariff energy meters shall be in the scope of the bidder. There shall be the requirement of RS 485 MODBUS communication between all the energy meters and their remote display units with IoT base DCU.
- 2.7 The web-based software solution shall be built on service-oriented architecture for data exchange between various other existing and future IT systems of the DISCOM/GPRD Cell.
- 2.8 The data shall be stored and made available for various analysis, generation of exception reports, and export to third party systems and energy audit. DCU provided by bidder for Distribution Box should have internal data storage provision. This will be useful in the event of communication failure with the cloud/Central server.
- 2.9 The System shall be accessible on the intranet, internet, and the information dissemination would be primarily through a web site designed on responsive technologies for facilitating access through a mobile device, tablets, laptops, desktops, etc.
- 2.10 For the data communication; there are various methods for the same and If the successful bidder adopts the GPRS based communication method from DCU to Cloud/data server then provision for dual SIM cards of different service providers shall be in the scope of the bidder. The dual SIM cards are required for the redundancy in data availability. The selected SIM cards shall be 2G, 3G, 4G compatible with fallback to 2G and 3G for redundancy. The monthly SIM charges will be borne by the bidder. It is the bidder's responsibility to check the network coverage at the site. Please note that bidder is free to use any other communication technology (such as VSAT etc.) other than SIM card to achieve SLA. However, all charges required for communication are to be borne by the bidder. Contractor shall suggest one or more appropriate options for the proven communication technologies working effectively in India. The complete set of equipment shall be offered; for their effective and trouble-free

operation. Such parts will be deemed to be within the scope of the supply; irrespective of whether they are specifically indicated in the commercial order or not.

- 2.11 The register mapping for instantaneous parameters, Load Survey, Billing data, and Tamper events shall be uniform for all the meter manufacturers. The register address mapping against the parameters shall be as per the enclosed Annexure No: ___. Bidder must provide all the parameters irrespective of the make of the meter only in the standard format to confirm the seamless interoperability in the future for the whole system. Interoperability here shall mean, Meter of various make shall be capable to communicate with the IoT based DCU & vice versa.
- 2.12 The software should be based on a robust architecture model, a framework that is suitable as per the project including routine operations and maintenance of distribution Company considering 7% annual growth. Initially, the software to be supplied should be suitable for handling up to 100 Intelligent Power Distribution Boxes and it should be scalable for more as per requirement.
- 2.13 The system should be capable of acquiring Instantaneous load parameters on real-time, relay status and programmable intervals as decided by DISCOMs and can pull and push the data as and when required from the controller by GPRS connectivity.
- 2.14 If any modification felt necessary to improve performance, efficiency, and utility of equipment, the same must be mentioned in the 'Modification schedule' with reasons duly supported by documentary evidence and advantages. Such modifications suggested may or may not be accepted, but the same must be submitted along with Pre-Bid Queries. The modifications not mentioned in Schedule will not be considered.
- 2.15 It is not the intent to specify completely here in all the details of the design & construction of material. However, the material shall conform in all respects to high standards of Engineering, design and workmanship operation in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which in his judgment is not in accordance therewith. The offered material shall be complete with all components necessary for their effective and trouble-free operation. Such components shall be deemed to be within the scope of bidders' supply irrespective of whether these are specifically brought out in his specification and/or purchaser order or not.

3.0 SPECIAL INSTRUCTIONS TO BIDDER:--

Please read the following instructions carefully before submitting your bid.

- 3.1 To ascertain the highest reliability of the system offered, the bidder shall be the manufacturer of one of the critical components of the system, viz. Transformer OR IoT Based DCU OR SCADA based solution developer, etc.

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- 3.2 The bidders are required to submit the consent of the meter manufacturer/s who are registered vendor of the GUVNL or its subsidiaries and shall also have successfully executed minimum two orders of 1 phase uni-directional/Bi-directional tariff energy meters for GUVNL or its subsidiaries.
 - 3.3 The bidder has to execute all required work on a TURNKEY basis, i.e. Supply, customization, installation, testing, deployment and maintenance of necessary hardware/sensors, software. It is bidder's responsibility to replace/repair all existing sensors/devices including all wiring required for monitoring / controlling of the above parameters to meet the scope of work during CMC period.
 - 3.4 All the drawings, i.e. elevation, side view, plan, cross-sectional view, etc., in AutoCAD format and manuals in PDF format, for offering items shall be submitted. Also, the hard copies as per specification shall be submitted.
 - 3.5 The bidder shall submit a Quality Assurance Plan for the manufacturing process and Field Quality Plan with the technical bid.
 - 3.6 All the points other than GTP, which are asked to confirm in technical specifications must be submitted separately with the bid.
 - 3.7 The bidder is required to impart training given manufacturing, assembly, erection, operation and maintenance for offering the item, in his works, to the person/s identified by the DISCOMs, in the event of an order, free of cost. In the training session, the bidder shall confirm that he has to impart all the aspects of design, operations, the objective of the individual components, possible defects, and corrections
 - 3.8 Before proceeding with the execution of the aforesaid work, the bidder shall fully familiarize himself with the site conditions. It shall be the responsibility of the Successful bidder to arrange all inputs required for detailed engineering and execution. The Bidders are advised to visit the proposed pilot project site, collect all necessary inputs and acquaint themselves with the topography, infrastructure, etc. The Successful bidder shall be fully responsible for providing all equipment, materials, system, and services specified or otherwise which are required for complete implementation of the Feeder Monitoring System.
 - 3.9 The bidder shall bring out all the technical deviation/s only at the specified annexure.
 - 3.10 The bidder has the responsibility for three-year comprehensive maintenance (includes supply of materials and labor, cloud/Dashboard Modification support) of the intelligent power distribution box system after the successful installation and satisfactory operation of the whole pilot Project. The Successful Bidder has to assure that the breakdown occurred in any supplied hardware (i.e. relay, DCU, terminal blocks, connectors, etc. in general the whole intelligent power distribution box System) shall be rectified within Five days from the date of intimation. For the immediate power supply restoration at consumer site, bidder is

required to maintain the spares at DISCOM's store. The defective distribution box shall be repaired or replaced at store; No scope of opening or repairing of the distribution box or its components at site.

- 3.11 The contractor shall have to replace faulty components/whole power distribution boxes within Five days after the intimation given by DISCOM Officer at Subdivision/division Store during CMC/AMC/Guarantee Period. The bidder shall be charged the penalty@1000 rupees/Day if it is not repaired within the stipulated time. The software supplied by the successful bidder shall have an inbuilt program to calculate the penalty report with logged data.
- 3.12 The Bidder is required to take the necessary cybersecurity measures. Bidder shall ensure the device's cybersecurity with due consideration of authentication, data privacy, confidentiality and as per the latest cybersecurity guidelines of CERT-In specified at <http://www.cert-in.org.in>. Provided devices shall have required security audit compliance/certification.
- 3.13 UAT shall have to be given by the successful bidder to achieve desired results.

4.0 SERVICE CONDITIONS:-

4.1 SYSTEM PARTICULARS/DISTRIBUTION NETWORK PARAMETERS:-

The normal system parameters of the distribution network are as below.

Particulars	Details	
Rating of distribution Box	3 KVA	5 KVA
Highest System Voltage (L-L)	1.2 KV	1.2 KV
LV Side Nominal System Voltage	250 Volts, 1 Phase with Solidly grounded Neutral	250 Volts, 1 Phase with Solidly grounded Neutral
System Frequency	50 Hz±3% Tolerance	50 Hz±3% Tolerance
The approximate full load current of the transformer	12 A	20 A
Maximum Nos of Outgoing Circuits	3+1 Nos	5+1 Nos
% Impedance	2.5%	2.5%
Rated short-time withstands current of Dist. Box.	0.5 KA for 1 Sec.	0.8 KA for 1 Sec.

4.2 ATMOSPHERIC PARTICULARS:-

The atmospheric conditions under which the measuring components should perform continuously and successfully are mentioned as below.

Maximum Ambient Air Temperature	50° C
Minimum Ambient Air Temperature	5° C
Maximum daily average ambient air temperature	40°C
Maximum humidity	95%
Altitude above M.S.L. (maximum)	1000Mtr
Average annual rainfall (mm)	925
Max. wind pressure(Kg/sqm)	200
Seismic level (Horizontal accn.)	0.3 g
Iso-ceraunic level(Days per Year)	50
Average thunder storm days per annum	50
Note: The climatic conditions are prone to wide variations in ambient conditions and hence the equipment shall be of suitable design to work satisfactorily under these conditions.	

5.0 APPLICABLE STANDARDS:

Unless otherwise specified elsewhere in this Specification, Distribution transformer, IoT based DCU, Enclosure, relay, and other associated accessories shall conform to the latest revisions and amendments thereof to the following standards.

Sr No	Applicable IEC/IS	Description
1	IS 3427:1997	A.C. Metal Enclosed Switchgear and Control gear for Rated Voltages Above 1 kV and Up to and Including 52 kV
2	IS:60947/2007 (Part 1)	Specification for Low-voltage Switchgear and Control gear – Part 1 : General Rules& Annex 'C' for Degrees of Protection provided by enclosures of electrical Equipment
3	IS 8623 (Part 1,2 & 3)	Specification for Low Voltage Switchgear and Control gear assemblies
4	IS/IEC 60529	Degrees of protection provided by enclosures (IP CODE)
5	IS 11171 :1985	Dry-Type Power Transformers
6	IS 2026	Power Transformers
7	IS 14772:2000	General Requirements for Enclosures for Accessories for Household and Similar Fixed Electrical Installations
8	IS 13410:1992	Glass-reinforced polyester sheet moulding compounds (SMC)

9	IS 2099/IEC 60137:2008	Bushings for alternating voltages above 1 000 Volts
10	IS 10118	Code of practice for the selection, installation, and maintenance of switchgear and control gear
11	IS 5561	Electric Power Connectors
12	IEC 61000-4-2,3,4,5,6,8,11	Electromagnetic compatibility (EMC) - Part 4-: Testing and measurement techniques
13	IS 2551	Danger notice plates
14	IS: 6005/1998	Code of practice for phosphating iron and steel
15	IS: 5/2004	Colour for ready-mixed paints and enamel
16	IS: 732/1989	Code of Practice for Electrical Wiring Installations
17	CEA Regulation 2010	For safety
All Indian Electricity Rules/ Bills amended up to date applicable for clearances, safety and operation of the equipment		

Equipment meeting with the requirements of any other authority's standards, which ensures equal or better quality than the standard mentioned above as well as the latest standard shall also be acceptable. If the equipment, offered by the Bidder confirms to other standards, salient points of difference between the standards adopted and the specific standards shall be brought out in a relevant schedule. In case of any difference between provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail. One hard copy of such standards with authentic English Translations shall be furnished along with the offer.

6.0 DEVIATIONS:

- 6.1 Any deviation from these specifications, proposed by the tenderer, intended to improve the performance, utility and overall efficiency, will be given due considerations provided full particulars of the deviation with justifications thereof are furnished. In such a case, the tenderer shall quote according to specification and the deviations proposed by him shall be quoted as alternate/alternatives.
- 6.2 The pre-bid meeting shall be arranged by the purchaser with an eligible tenderer for the particular requirements of these specifications, site conditions, mode of transport, availability of site, erection, and commissioning, etc. It is advised that the bidders visit the site/sections, familiarize themselves with the local conditions, understand the requirement of the system in detail, before tendering the bids, and obtain clarifications as may be necessary from the purchaser. After the award of the contract, the tenderer shall be fully responsible for the successful integration of the compensation scheme.

7.0 GENERAL TECHNICAL REQUIREMENTS :

- 7.1 The Metallic intelligent power distribution box intended to use for outdoor purposes. It shall mainly be divided into two compartments, Distribution transformer compartment, and Metering Compartment.

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- 7.2 The Distribution transformer compartment shall be designed to accommodate a 3KVA/5KVA Single phase, Air Natural type Distribution transformer. There shall be proper/adequate ventilation inside the enclosure so that hot air inside the enclosure is directed out by the help of the duct. Louvers apertures shall be provided so that there is the circulation of natural air inside the enclosure as per the drawing.
 - 7.3 The Metering compartment shall be designed to accommodate 3+1/5+1 Nos 1 phase, 5-30 Amp, Accuracy class-1, static energy meters, IoT based DCU, single pole single through latching relays, power terminal blocks, and M-4 type terminals.
 - 7.4 The backlit type LCD Display unit shall be provided at each consumer premises for instantaneous parameter viewing facility for consumer and it shall be enclosed in the SMC box enclosure. The communication of remote LCD with DCU shall be wired type. 2.5 mm², aluminum type PVC insulated two core service wire will be supplied by Purchaser, however, plug and play type terminals shall be provided by the contractor.
 - 7.5 There shall be the MODBUS communication between all the meters with IoT base DCU.
 - 7.6 The system should be capable of acquiring Instantaneous, data on the programmable interval of 5/15 minute (push mode) and can pull the on the programmable interval of 5/15 minutes (pull mode) and can pull the data as and when required from meters connected to IoT base DCU by GPRS connectivity. Pre-defined alerts such as Power off, overload, high temperature, door open, etc. should be pushed automatically on a real-time basis. i.e instantaneously. It shall also propose to obtain the instantaneous data with a timestamp from each installed meter, through Modbus RTU protocol to IoT base DCU at a predefined interval (as of now 5/15 minutes). The Modbus memory map of the energy meter is as per the attached annexure. The IoT based DCU shall push these acquired data to the Central Client and Cloud servers through GPRS communication.

8.0 Metal Enclosure

- 8.1 The enclosure shall be made up of CRCA Metallic of at least 1.6 mm thickness (Before Painting). The fabrication, involving welding, shall not have more than two joints. The Welding shall be done by MIG (Metal Inert Gas) welding process.
- 8.2 The base of the enclosure shall made of at least 2 mm MS Sheet to ensure rigidity for easy transport and installation.
- 8.3 Two sets of louvers shall be provided on the side walls (as shown in the drawing). The louvers shall be backed up by perforated stainless steel sheets of 0.5 mm thickness welded from inside the box for preventing dust, insects, and rainwater getting inside the box. As such box enclosure will be provided with IP- 44 protection and entry of fresh cool air and to maintain the temperature rise limits of various components provided inside the box as per IS.

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- 8.4 For better ventilation in the transformer compartment, MS pipe made ventilation duct shall be provided on the top part of the compartment as per the attached drawing. The ventilation duct shall have a proper provision on top to avoid water ingress and external access to the internal parts of the compartment as per the drawing. Moreover, one additional ventilation hole with perforated stainless steel sheets shall be provided at the bottom of the transformer compartment as mentioned in the drawing.
- 8.5 The general overall dimensions of 3 KVA Intelligent power distribution box shall be as per drawing. Exact dimensional drawings shall be furnished by the bidder with the offer.
- 8.6 The structure of the enclosure shall be capable of supporting the gross weight of all the equipment & the roof of the enclosure shall be designed to support adequate loads.
- 8.7 The roof should be given a slope of 5° to 15° to drain the rainwater easily.
- 8.8 Transformer and Metering compartments shall be accessible on the front sides of the enclosure through double doors equipped with lock & key facility and nitrile/neoprene rubber seal. The doors shall be padlocked and/or lock protected to ensure the theft-prone locking arrangement. Heavy-duty hinges shall be provided for each door such that they are not visible from outside and hence not removable. The outgoing of the distribution transformer shall be connected directly to the Incomer of LV distribution through PVC insulated 4mm², single-core, copper conductor, flexible Cable. The transformer and Metering compartment should be isolated from each other internally. Also, the locking arrangement shall be such that the transformer chamber door cannot be opened when HT is energized. Two No. lifting arrangements shall be provided on both sides of the compartment. The bidder may suggest electrical interlock hence to confirm that the door of the enclosure cannot be opened when HT of transformer is energized.
- 8.9 Two Nos HV Bushings shall be mounted on the top cover of the transformer Compartment HV bushings shall be mounted on curvature shaped embossed plate, in such a way that all H.V. Bushings shall remain parallel and at equidistance throughout. Bushings having type tested, as per relevant IS amended up to date shall only be acceptable. The porcelain part of the HV bushings shall be as per IS 8603 (part I & III)-1977 (for heavily polluted atmosphere). The rated values, performance requirements & tests for HV Bushings shall be in accordance with IS 2099-1986. The Clamping arrangement of 12 kV porcelain Bushings shall be in accordance with IS: 4257 (part I)-1981.
- 8.10 EARTHING: All non-current carrying parts of the enclosure shall be earthed by a common earth conductor. Two nos. earthing terminals (i.e. 1. transformer neutral earthing 2. body/equipment earthing) shall be provided on the enclosure. Transformer neutral earthing terminal shall be insulated from the body earth and suitably brought out from the enclosure for connecting to external system earth through LV bushing and shall be provided on transformer compartment wall of enclosure. Body/equipment earthing terminal shall be

provided on metering compartment wall of enclosure. The transformer neutral earthing internal termination cable shall be of 6mm² PVC insulated flexible copper. The diameter of the stud shall be at least ½" with minimum length of 2" with two nuts of plain and one spring washer and nut and shall be able to connect and terminate the external earth conductor. The connecting point shall be marked with the "Protective earth" symbol as per IEC. All hinge doors shall be earthed to the enclosure with the green colour copper flexible wire of size 2.5 sq. mm (min). Two Nos of PiC type earthing as per attached annexure No-1 shall be provided for each power distribution boxes. The connections from the earth electrode to the equipment shall be done using minimum 25*3 mm GI strip with appropriate length required as per the site conditions. The GI strip shall be insulated by 3 KV heat shrinkable insulated tube to prevent electrical accidents by touch potential.

- 8.11 All other bolts, nuts and plain washers used for tightening purposes including connectors should be of M.S. hot-dip galvanized. Bolts, nuts washers also shall be hot-dip galvanized.
- 8.12 Temperature sensor of following specifications shall be provided in each power distribution box to measure temperature of transformer compartment.
1. Temperature range: 0 to 120 Degree.
 2. Accuracy: +/- 0.5 Deg. Cel
- 8.13 **Paint:** All paint shall be applied on clean, dry surfaces under suitable atmospheric conditions by seven tank process and powder coating. The paint shall not scale off or crinkle or be removed by abrasion during normal handling. The enclosure for the sub-station shall be painted with shade as above. A sufficient quantity of touch-up paint shall be furnished for application at site. The powder coating shall be of Siemens Grey shade RAL7032. The thickness of the painting shall be around 60 microns.
- 8.14 Suitable Mounting arrangement in the form of acrylic sheet of sufficient thickness for 03+01/05+01 Meters, Contactors, 1 DCU Input/output Glands at the bottom side of the box shall be provided. There shall be a provision of Electro-Mechanical Switch to notify unauthorized access for the Opening of the door of the Box.
- 8.15 The entire design and construction of metallic enclosure shall be capable of withstanding severe stresses likely to occur in actual service.
- 8.16 **Mimic:** A single line diagram showing the direction of power flow shall be prepared and available on the backside of the metering compartment door.
- 8.17 **Name Plate:** Name and rating plate/markings shall be provided as per the relevant standard applicable to each component/assembly to be used in the components. All labels other than "danger" or "warning" labels shall have black lettering on a white background. Danger label shall be as per applicable standard and shall not be fixed on to removable parts. Stick-on

type labels of good quality and permanent mounting shall be acceptable for internally mounted components only.

8.17.1 The enclosure shall be provided on the front side of the door; with the nameplate of anodized aluminum, with white engraving on black background. They shall be properly secured with self-tapping screws at the top of the cubicles. The enclosure/components descriptions shall be as indicated in the drawings. The size of the nameplates shall be proportionate to the respective equipment. Also, individual panel number and danger plate shall be furnished at the back of the panel. Nameplate containing the following particulars shall be riveted inside and outside of the enclosure door.

1. Manufactured by _____
2. AT No & Date
3. Year and Month of Manufacturing
4. Serial Number of Box
5. KVA Capacity and voltage ratio of Distribution Transformer
6. Nos of energy meters/ Meter capacity in amp
7. Degree of Protection of the enclosure
8. Property of "DISCOM"

8.18 The enameled danger notice plate as per IS: 2551 /1982 of size 200x150mm shall be riveted in pilfer proof manner on the front side of the transformer compartment door.

9.0 Distribution Transformer :

9.1 PRINCIPAL PARAMETERS

The Dry typed Single Phase distribution Transformers shall be suitable for outdoor application having Primary voltage is 1.1KV (L-L) and secondary voltage is 240V (P-N), 50 Hz Power distribution system in which the neutral is effectively earthed and The transformers are suitable to operate satisfactorily under supply voltage fluctuation for +10 % to -15%. The total losses of the transformer shall be restricted such that the heat due to losses; must be dissipated naturally through air ventilation in metal enclosure. There shall be two separate windings. One primary and 2nd secondary with proper electrical isolation between two windings.

The transformer shall conform to the following specific parameters.

Sr No	Particular	3 KVA Transformer	5 KVA Transformer
1	Type of Transformer	Enclosed Dry-Type Transformer (Here, Enclosure means Power Distribution box Enclosure)	Enclosed Dry-Type Transformer (Here, Enclosure means Power Distribution box Enclosure)

2	Installation Type	Outdoor enclosed in a metallic enclosure	Outdoor enclosed in a metallic enclosure
3	Ventilation	Air Natural (AN)	Air Natural (AN)
4	Type of Unit	Single Phase	Single Phase
6	Frequency of supply	50 Hz±3%	50 Hz±3%
7	Rated capacity	3 KVA	5 KVA
8	Rated Voltage-HV (L-L)	1.1 KV	1.1 KV
9	Rated Voltage-LV (L-n)	0.24 KV	0.24 KV
10	Highest system Voltage	1.21 KV	1.21 KV
11	Tap changing arrangement	Not Required	Not Required
12	Maximum full load losses at 75°C (W)	80 Watts	100 Watts
13	Iron losses (W)	Not more than 20 Watts	Not more than 35 Watts
14	Total Load Loss in watt at 100 % loading (Load loss + iron loss)	Not more than 100 Watts	Not more than 135 Watts
15	% Impedance at 75 Deg. C	2.44%	3%

9.2 TRANSFORMER CORE-

9.2.1 The magnetic core shall be built of very low loss Silicon steel, M4 grade cold rolled grain oriented (CRGO) steel. Core should be of stack/wound core type.

9.2.2 The material used for insulating the sheets, shall have high interlamination resistance and rust inhibiting property. It shall not be deteriorated by ageing under maximum operating temperature and clamp pressure of the core disintegrated due to mechanical modes of core vibration. It should have the least tendency to absorb moisture, or to react with the moisture present in the air which may accelerate deterioration of insulation.

9.2.3 The assembled core shall be securely clamped in the lines and with the uniform pressure so as to minimize the noise from the core during the operation of the transformer.

9.2.4 The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated in the offer. The bidder should maintain the following documents for the confirmation of the core material used in the transformer. The documents shall be verified by the inspecting officer during the factory visit or at the time of acceptance test.

- I. Invoice of supplier
- II. Mills testing certificate
- III. Packing list
- IV. Bill of loading

V. Bill of entry certificate to custom

9.2.5 The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) upto 12.5% without over heating during the full load conditions and shall not get saturated. The Bidder shall furnish necessary design data for the confirmation of this technical requirement.

9.2.6 The nominal flux density in any part of the core shall not exceed 1.69 Tesla at 1.0 p.u.voltage and 1.9 Tesla at 1.1 p.u.voltage. The bidder shall furnish necessary design data in support of this technical requirements.

9.3 **WINDINGS:**

9.3.1 HV and LV windings shall be wound from Super Enamel covered /Double Paper covered,aluminum/Copper conductor.

9.3.2 Joints in the winding shall be avoided. However, if jointing is necessary the joints shall be properly brazed and the resistance of the joints shall be less than that of parent conductor.

9.4 **LOSSES:**The bidder shall mention in his offer the loss parameters for No Load losses and Load losses in separate manner. The offered losses for each rating of transformer shall not be more than the requirement of losses mentioned in the GTP in Annexure_1. The losses of transformer at 50% and 100% loading condition (@ rated voltage & frequency, at 75°C temperature) shall also be clearly mentioned in the offer.

9.5 All ferrous bolts, nuts and washers, used in outside shall be hot dip galvanized to prevent corrosion and atmospheric effect. However, the high tensile steel bolts and spring washers shall be electro-galvanize or electro-plated. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals.

9.6 **OVERLOAD CAPACITY:**The transformers shall be suitable for loading as per latest IEC 60076-12/IEEE C57.96-1999.

9.7 **NAME PLATE:**Each transformer shall be supplied with a rating plate made from weatherproof material, fitted in a visible position, showing the detail as per the reference name plate mentioned in the Annexure_2. The entries on the plate shall be indelibly marked (for example, by etching, engraving or stamping) .The name plate shall be as per IS 11171.

10. **WIRING:**All wiring shall be of switchboard type consisting of copper conductor of 1.5 Sq. mm. for alarm / annunciation / control circuits and 2.5 Sq.mm. for Power and all other Circuits insulated with PVC insulation suitable for 660 Volt service and in accordance with relevant IS:732. Polyvinyl Chloride used shall have excellent resistance against burning, moisture, oil, and vermin and shall be finished with clear colour. Rubber insulated wiring shall not be acceptable. Bidder shall furnish the details of the method being adopted by them for

Joint/ Connections. All instruments and Panel wiring shall be of heat-resisting and self-extinguishing type in compliance with IS. Plastic or porcelain cleats of the limited Compression type shall be used for holding wiring runs. All wires shall be suitable for bending to meet the terminal studs at the right angles. Metal cases of all apparatus mounted on panels shall be separately earthed by means of copper wire or strips.

The following colour scheme of the wiring shall be used as per IS:375.

1) Phase: Red. 2) Neutral Conductor: Black, 3) Connection To Earth: Green 4)DC Circuit: Grey

Ferrules engraved/printed with the same number, letters or symbols as indicated in the connection and wiring diagram shall be provided on the terminal ends of all wires for the identification of circuits for inspection and maintenance. Ferrules shall be of strong and flexible insulating material with a glossy finish to prevent adhesion. They shall be engraved/printed and marked and shall not be affected by dampness. Ferrule numbering shall be in accordance with IS:375. The same ferrule number shall not be used on wires in different circuits on an enclosure.

11. Power Contactors/Relay:

- 11.1 As mentioned in the scope, the objective of the power contactor/relay for each outgoing power circuit to the consumer is to control it separately for overload, remote disconnection for arrears recovery, detection of power theft etc. as decided by the discom.
- 11.2 Contacts shall withstand repeated operation and shall make or break the rated currents in their circuit without deteriorating. All spare contacts shall also be wired upto the external terminals.
- 11.3 All contactors/relay in tripping circuits shall have mechanically operated flag indicators. Indicators, mechanical or electrical, shall also be provided on other relays to identify the type of fault that may have occurred. Indicators shall be capable of being reset without opening the relay case. It shall not be possible to operate the relay by hand or to alter its setting, without opening the case. All relays shall operate satisfactorily from 70 to 110% of rated voltage

12. DCU:The IoT Based DCU shall essentially consist of the followings:

- 1. The input auxiliary voltage of the control shall be ranging from 230 V(-20% to +20%) AC and it operates on a 50 Hz system.
- 2. The DCU shall have input line fuse/MCB protection
- 3. The DCU shall run diagnostics at power up and shall have a continuous communication error checking facility.
- 4. System firmware and user configuration will be maintained in flash memory so as not to be lost during power interruptions.
- 5. There should be a provision in DCU to change the controlling parameters (frequency of data logging and data communication) from the central data center using GPRS/CDMA 2G/3G/4G (compatible with fallback to 2G and 3G) communication. The DCU should have

the capability to capture and transmit the supply status data in real-time. The auxiliary power supply requirements of the DCU shall be managed from the LV side of the transformer. It is to keep while designing that the DCU shall not be electrically loaded to consumer metering. . All the required cabling and installation of the supplied components shall be the responsibility of the bidder.

12.1 The DCU shall have the following Communication Interface,

12.1.1 Serial Connectivity: The DCU shall communicate with at least 06 nos of consumer energy meters using MODBUS protocol over RS485. There is also the requirement to separately connect the display unit of each consumer serially through DCU. Thus DCU shall be compatible for above two specific requirements of the project. It shall have at least 03 serial RS 485 ports (one nos of energy meters, one nos for remote display unit, one nos spare) to communicate panel energy meters on RS 485 multi-drop bus communication.

12.1.2 MODBUS communication shall be over a 2-wire as specified under TIA/EIA-485-A. The DCU shall be able to communicate on a baud rate of 9600, 19200, 38400, 57600 and 115200 bps as per the requirement of the individual connected equipment. The RS485 connections shall be through the RJ45 connector. The Protection shall be up to 2000 Vrms isolation from Input Power Supply, Field IO and Controller.

12.1.3 The DCU shall provide for additional field interfaces through 8 digital inputs with Dry/Potential Free Contacts and with isolation up to 2000 Vrms and at least six relay outputs with isolation up to 4000 Vac. The relay output shall be capable of handling 230 VAC, currents up to 5 A, electrical endurance of at least 100,000 cycles and mechanical endurance of at least 10,00,000 cycles.

12.1.4 The DCU shall be supplied with two analog Inputs with following technical particulars,

- a. Input Range: 0-10 VDC / 0-20 mA (with external resistor of 500 Ohms, 0.1%)
- b. Accuracy: 0.2% FSR @ 25 deg C
- c. ADC: 24-bit Sigma-Delta ADC
- d. Software Configurable Analog Inputs: 0-10VDC / 0-20mA / 4-20mA
- e. Multiple Display: Raw Count / Electrical Value/Engineering Value

12.1.5 DCU shall have built-in Real-Time Clock (RTC) with separate battery backup. The battery shall have a guaranteed life of 10 years. It shall have a self-diagnostic feature for RTC, memory, battery, communication module, etc. Alternatively, Software-driven RTC may also be used as per agreement between supplier and utility. It shall also propose to obtain the instantaneous data with a timestamp from each installed meter, through Modbus RTU protocol to IoT base DCU at a pre-defined interval.

12.1.6 Ethernet connectivity (Optional) :DCU shall have Ethernet Connectivity to communicate via MODBUS TCP protocol with local PC for Meter Data Acquisition using LAN: 10/100

BASE Ethernet Connectivity and shall be Protected up to 1500 Vrms magnetic isolation (IEEE 802.3 compliant)

12.1.7 It shall be configurable over web server MODBUS Over HTTP Protocol

12.1.8 The DCU shall communicate with the cloud server through 2G/3G/LTE GPRS connectivity using a secure communication protocol. The DCU shall be capable of also providing data to DISCOM's server or any other server specified by the Client in the format requested by the Client.

12.1.9 The DCU to server communication interval should be configurable in multiple of 1 minute for a different group of data. DCU should have provision for on-demand communication for data and configurable read and write

12.1.10 The DCU shall have dual SIM capability and quad-band GSM/ GPRS connectivity, GPRS shall be multi-slot Class 12, with low power consumption and operating temperature range of 0 to 80°C.

12.1.11 **Over the air (OTA) capability:** The DCU shall have OTA capability to update the DCU's configuration with prior approval of DISCOM, add/ rectify configuration files of meters change data formats, change communication destination locations, troubleshoot software bugs (if any) in a secured manner.

12.1.12 **History backfills during GPRS Failure:** In case of failure of GPRS connectivity, the DCU shall store the required data in an SD card, which shall serve as its internal memory storage. Once GPRS connectivity is restored the DCU shall synchronize with the cloud server and communicate all the missing data. SD card shall be able to store data Up to 150 parameters periodically at an interval of 5/15 minutes and up to 10000 event data with local timestamp

12.1.13 **Remote Diagnostics:** The DCU shall be capable of supporting remote diagnostics such as RSSI (signal strength), network status, GPRS status, connectivity status and shall be capable of remotely restarting the GPRS module. The DCU shall also be capable of local RS485 master diagnostics including the number of communication failures per port, number of errors per port, meter-level communication error, and so on.

12.1.14 **Event/Alarm Server:** To configure and process events against any measured parameter (Voltage/ AMP /KW etc.)

12.1.15 The DCU shall be provided with 8Nosof Digital inputs(Six Nos of six relay, 1 nos for door sensor, 1 no spare) with isolation up to 2000 Vac.

12.1.16 In case of an event, Event Status shall update onWeb Page connectivity and alarm server will push message to the remote cloud with a snapshot of all meter parameters in that group.

12.1.17 **Secure Wi-Fi:** The DCU shall have the capability of being connected locally through its secure WiFi. Access to this WiFi shall be through a hand-held device such a mobile phone with both reads & write access. The Contractor shall provide an appropriate mobile application (the “Mobile App” or “App”) to connect with this WiFi in a secure password-protected manner to connect to the DCU. Both meter reading & writing shall be allowed over WiFi; i.e. the capability of programming the DCU over WiFi shall be enabled. The authentication for WiFi Communication with IoT Gateway shall be with HTTPS protocol.

13. CentralIoT SCADA - Cloud-based

The web-based IIoT SCADA shall essentially consist of following modules:

13.1 IO Server

- I. IO Server should be capable enough to handle Upto 10000 devices and process Upto 250000 parameters
- II. Automatic history backfill

13.2 Event/Alarm Server

- I. Events for Hard Tag as well as Soft tags
- II. Multiple event status: Normal, High, High-High, Low, Low-Low, On, Off
- III. Alarm History with a timestamp

13.3 Notification Server

- I. Notifications for Hard Tag as well as soft tags
- II. Configurable Email and Push Notifications on event
- III. Configurable device action on the event

13.4 Soft Tag Engine

- I. Soft Tag engine to apply different types of formulas and equations on hard tags
- II. Trends, events, notifications against soft tags

13.5 Historian

- I. Data storage as well as a formula based archiving
- II. To store and retrieve data of thousands of parameters
- III. NoSQL/Big Data database technologies to retrieve time series data for trends and analysis

13.6 Dashboard, reports and user interface

- I. The application software shall have drill-down dashboards for depicting the real-time status of the feeders along with the details of the energy flow statistics. The details and formats of the dashboards and reports that need to be generated online shall be finalized with the successful bidder during the implementation. Further, the successful

bidder should provide for changes, updating, and modifications, new dashboards, and reports during the CMC/AMC period as per the requirement of the DISCOMs/ GPRD Cell; free of cost. The reports shall be generated and published periodically on the webserver and shall be readily available for download and consumption. Further, all the reports generated shall have the option of exporting into the doc, XLSX, pdf, etc.

Following facilities to be provided on web Dashboard.

- I. DISCOM Office HierarchywiseGeo View/Normal view based dashboard for all Intelligent Power Distribution Box for monitoring power status of each connected consumer
- II. Consumers Meter real-time parameters
- III. Real-time view and data log of communicating and non-communicating period of Power Distribution boxes.
- IV. Real-time view of instantaneous electrical parameters of each consumer.
- V. Interactive and responsive data tables to filter, search, sort set of data
- VI. Customized reports, graphs and templates with Report manager having auto-scheduling features
- VII. DISCOM Office HierarchywiseSome of the reports that need to be generatedat desired periodicity are
 - a. Consumer wise energy audit report
 - b. Transformer wise Energy audit report
 - c. Consumer wise electrical parameters on an interval of 15 min or defined by the utility.
 - d. Consumer wise Daily Max,Min, and Avg Load(KW,AMP), Voltage, Power Factor, KVAR
 - e. Various Report with a demand/ energy comparison with previous year/Quarter/Month
 - f. Communication port error of each consumer
 - g. Consumer wise Periodic billing, load survey and temper data report.
 - h. Consumers history of relay tripping either by overloading or remote disconnection
 - i. Dual-axis Trend graph analysis with multiple parameters like voltage, amp, pf.
 - j. Any other report which can be generated from the available data.
 - k. Consumer wise billing data and preparation of monthly/Bi-Monthly energy bills on the basis of AMR.
- VIII. Finalization of reports which are to be available on the system shall be finalized before the commencement of work.
- IX. The MDAS servers should have the capability to send SMS alerts to operators in case of communication failures to receive data from any meter beyond 4 hours.
- X. Data should be compressed and encrypted during transfer

14. Design, develop and deploy the web-based software solution (SHALL BE HOSTED ON CLOUD COMPUTING)

General scope is to design, develop, install and implement the required web-based software solution for data acquisition, data aggregation, data storage in a common format, data dissemination, data display on a responsive website, data analysis and depiction in form of

dashboards, graphs and MIS reports, etc., provision for automated Notification, SMS alerts, and email.

The system should be capable to maintain a geographic, administrative and regional hierarchy of the utility with the provision to navigate to the desired level with the drill-down mechanism.

The system should have Add, Edit, and Delete feature.

Sr.No	Feature Functionality	Details
1	System Architecture	The Latest IoT based system architecture is envisaged to provide ultimate flexibility, reliability, and scalability with adherence to industry standards and open architectures. Systems are to be acquired, developed, or enhanced in such a way that business processes; application and infrastructure services and data can be shared and integrated across the Utility and with potential business partners
2	Web-based design	All the application designed for this purpose shall be web-based and the Purchaser at workstation shall be able to access through the latest available version of the web browser such as Internet Explorer, Firefox, etc., Any add-on required must be integrated with the latest version released by the developer at the time of Bid opening
3	Business Process Requirement	Application requirements will be based on Utility's business processes and the functional requirements that derive from them. The application system should empower the Business Users in defining the business processes by process modeling
4	Database server	The applications must be capable of running in a clustered environment as high availability configuration of the database server that will run multiple workloads
5	Data Storage	Data is considered to be a utility wide asset and is to be shared across the utility. Datastores for transaction processing shall be kept separate from data stores for decision support
6	Mobile application	For display of critical information on Android base mobile, necessary software shall also be developed by the vendor. It shall be possible to enter outage reasons by designated users, after the fault notification.

The minimum specification or functionalities that need to be achieved by the web-based Solution.

- I. The System shall be secure and shall have user, role-based configurable configuration with required event logging.
- II. The meter data and event information acquired shall be stored in the data based on timestamp.
- III. The data obtained from various meters, relay, and sensors to be processed and stored into a common database format.

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- IV. The system shall analyze the meter data and generate various exception reports as defined and designed by the DISCOM/GPRD cell.
 - V. The system shall have the capability to exchange the meter data/sensor status data acquired with third-party systems through web services.
 - VI. The system shall have the inbuilt facility for DCU management i.e. to register, authorize and manage DCU devices.
 - VII. The entire transaction and events of communication, failure, etc., with the DCU, shall be logged along with time stamping.
 - VIII. The system shall have inbuilt user management and administration model for access control and logging for audit and audit trail.
 - IX. The system shall have inbuilt comprehensive MIS reports as per the requirements of the DISCOM with provision to add and modify the same as and when required.
 - X. The system shall have dashboards to depict the near real-time information emanating from the DCU on various critical and essential parameters as desired by the DISCOM.
 - XI. The system shall have a built-in ticketing system to recording issues, escalation and resolution.
 - XII. The system shall have inbuilt comprehensive help and manuals.
 - XIII. The system shall be secure, high available and responsive

The above requirements are high level and tentative, the successful bidder shall gather the requirements and prepare the system requirement specification and design, develop/configure the software as per the requirements of DISCOM. The bidder shall further update and provide for additional features and functionalities as and when required by DISCOM during the contract period without charging any cost. Impart the required training to DISCOM officers for the operation and usage of the system.

15. SECURITY:

The Network shall have adequate cybersecurity measures not limited to the measures as described below. The network security would be extended to all the interfaces also.

1. Secure Access Controls: The system shall include mechanisms for defining and controlling user access to the operating system environment and applications. Best practices from enterprise security including password strength, password aging, password history, reuse prevention, etc. must be followed for access control.
2. Authorization Controls: A least-privilege concept such that users are only allowed to use or access functions for which they have been given authorization shall be available.
3. Logging: Logs must be maintained for all attempts to log on (both successful and unsuccessful), any privilege change requests (both successful and unsuccessful), user actions affecting security (such as password changes), attempts to perform actions not authorized by the authorization controls, all configuration changes, etc. Additionally, the access to such logs must be controlled in accordance with the least-privilege concept mentioned above, so that entries may not be deleted, accidentally or maliciously.

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4. Hardening: All unnecessary packages must be removed and/or disabled from the system. Additionally, all unused operating system services and unused networking ports must be disabled or blocked. Only secure maintenance access shall be permitted and all known insecure protocols shall be disabled.
 5. Malicious Software Prevention: Implementation of anti-virus software and other malicious software prevention tools shall be supported for all applications, servers, databases, etc.
 6. Network Security: The network architecture of the HES must be secure with support for firewalls and encryption. The system shall also allow host-based firewalls to be configured, as an additional layer of security if the network firewall were to fail.

12.1 Secure Device to cloud Communication:

- I. Transport layer encryption should be implemented using the TLS/SSL protocol.
- II. TLS/SSL provides identification, authentication, and encryption of data to be exchanged between server and client.
- III. Authorization of the client should be provided. Authorization rules control which clients can connect to the server, and which topics a client can publish or subscribe too.

16. Operational support and maintenance of the solution

16.1 The bidder shall be responsible for the maintenance of the solution during CMC period i.e three year from the date from which the Solution becomes fully functional. The bidder shall beresponsible for providing the warranty of all software, hardware and associated accessoriesduring the five-year operational support and maintenance period. The bidder shall beresponsible for rectifying bugs and any other issues regarding the smooth functioning of theSolution. For this purpose, the procurer shall enter into a Service Level Agreement (SLA) withthe bidder. The SLA shall constitute the following:

1. Issues related to the application crashing and hanging, not responding / very slowresponse.
2. Issues related to data inconsistency, data security.
3. Failure of the application server, database server with reasons pertaining to the bidder
4. Wrong data is displayed in user interfaces.
5. Issues related to application security.
6. Issues related to reports.
7. Authentication / Authorization failure of users
8. Issues related to print outs of certain report formats.

Supply and implementation of required equipment, software, etc. to ensure the above is underthe scope of the bidder.

16.2 Entire Intelligent power distribution box System should be guaranteed for satisfactory operation and good workmanship at least for a contract period of one year and six months after the date of award of contract. If the contract is extended beyond this period at DISCOM discretion, the guarantee shall be extended automatically. During the period of contract all the supply, operate, repair, replacement, the maintenance cost of the entire system shall be borne by Bidder. The bidder shall handover the project along with the required licenses to the DISCOM in running condition and without any additional cost implications after operating for one year.

17. Training of DISCOM Engineers:

17.1 The bidder shall be responsible to provide handover training to the relevant user group of DISCOM/GETCO (Minimum one person per sub-station). For the same, the bidders shall draw a training schedule which shall be submitted to the DISCOM at the time of award of contract.

17.2 The bidder shall provide comprehensive training to the DISCOM officials. The training shall also include the necessary inputs that need to be fed into the application for updating the databases.

17.3 The bidder should provide necessary training to revise/modify the parameters as per the method specified in the DISCOM procedure.

17.4 The other activities related to training shall be :

- a. Preparing user manuals and FAQs for training.
- b. System administration training to be provided to DISCOM for first-level support

17.5 The training courses shall be structured and supported by “Illustrations, Video, and Charts. Certified trainers from the vendor’s office shall impart the developer and system administration training preferably. The vendor shall provide extensive lecture notes, handouts and other training documents. The training course shall cover the following:

- i. Device operation including data flow.
- ii. Basic Troubleshooting, identification and replacement of faulty devices.
- iii. Preventive maintenance of the devices

18. Availability and Performance Standards:

Equipment	UP Time
Central Data Center (Servers and Networking)	98%
DCU and Field devices	95%

19. Project Management: The successful bidder shall assign a project manager with the authority to make commitments and decisions that are binding on the successful bidder. The purchaser will designate a project manager to co-ordinate all purchaser project activities. All communications between the purchaser and the Successful bidder shall be coordinated through the project managers. The project managers shall also be responsible for all communications between other members of the project staff.

Project Schedule: The project implementation schedule is from the date of the detailed order. Based upon this schedule the bidder shall submit a preliminary implementation plan along with the bid. The detail project implementation schedule shall be submitted by the successful bidder after award for purchaser's approval, which shall include at least the following activities whichever shall be applicable:

- I. Site Survey
- II. Documents submission and approval schedule.
- III. Factory & Site Testing Schedule.
- IV. Database development schedule.
- V. Hardware purchase & Manufacturing, Software development & integration schedule.
- VI. Installation and commissioning schedule.
- VII. Training schedule.
- VIII. Training Schedule

The project schedule shall include the estimated period for completion and its linkage with other activities.

20. Documentation: To ensure that the proposed systems conform to the specific provisions and general intent of the Specification, the Successful bidder shall submit documentation describing the systems to the purchaser for review and approval. Further, the Successful bidder shall also submit the drawings/ documents for all the hardware & software required for site installation, testing and commissioning and thereafter operation of the system. The successful bidder shall obtain approval of the purchaser for the relevant document of each stage before proceeding for manufacturing, system development, factory testing, site testing, training, etc. The schedule for submission/approval of each document shall be finalized during the discussions before placement of the contract, this schedule shall be in line with the overall project schedule.

20.1 Each document shall be identified by a Successful bidder document number, the purchaser document number, and the purchase order number. Where a document is revised for any reason, each revision shall be indicated by a number, date, and description in a revision block along with an indication of official approval by the Successful bidder's project manager. Each revision of a document shall highlight all changes made since the previous revision.

20.2 The Successful bidder shall submit two copies of each document / drawing for the purchaser's review and approval. After approval five sets of all the documents shall be

submitted as final documentation, however, for site-specific documents two sets of documents shall be provided for each site. Any changes observed during field implementation shall be incorporated in the as-built drawing and required sets of the same shall be submitted to purchaser/ Purchaser. In addition to paper copies, all the documents shall also be provided on electronic media in two copies. In case any documentation requirement is specified in the relevant section the same shall apply for the equipment/system defined in that section. The successful bidder shall also supply five sets of User manuals/ guides/ O&M manuals/ manufacturer's catalogs for all the hardware & software supplied under the contract which shall be in addition to the one set each at all the locations where the system has been installed. The user manual shall at a minimum include the principle of operation, block diagrams, troubleshooting and diagnostic and maintenance procedures. Considering all the components of the project briefly, the following documents/drawings shall be required under the project.

- I. -Systemoverview documents
- II. Cross Reference Documents
- III. Functional Design Documents
- IV. Standard Design Documents
- V. System Administration documents- software utilities, diagnostic programs, etc.
- VI. Data requirements sheets.
- VII. Software Description Documents/ design documents for each software module.
- VIII. Bill of Quantity & List of software and hardware deliverable
- IX. Database documents.
- X. Drawings/ documents for manufacturing/ Assembly of the equipment/ system.
- XI. Drawings/ documents for the installation of the equipment/system at the site.
- XII. Factory Test report.
- XIII. Manuals for each equipment / hardware / test equipment.
- XIV. Site Testing documents.
- XV. Training documents.
- XVI. System Administration Manual.
- XVII. User guide.
- XVIII. Interoperability profiles/ Tables
- XIX. Site-specific Layout, Installation, GA, BOQ, schematics and cabling details drawings/documents
- XX. Substation monitoring system & IT Integration Plan Document using XML & other interfaces.
- XXI. Cyber Security Plan document & certificate/report

21. Type Test: All the type tests as under shall be carried out at the laboratories accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) or any International Lab. Accredited Cooperation (ILAC) or any govt. lab in accordance with relevant

IS/IEC latest amendments. Type tests shall not be more than 7 years old on the date of the Tender opening. All the applicable type tests for any specific component shall be carried out within the span of one year only. All the type test reports shall be submitted by the successful bidder at the time of bid submission OR within the commencement period as applicable.

21.1 **DCU:** The DCU shall be Type tested for Accuracy and for compliance to following EMI/EMC standards in any International Lab, Accredited Cooperation (ILAC) or an external NABL accredited laboratory or any govt. lab.

1. Electrostatic Discharge (IEC 61000-4-2)
Contact Discharge : +/- 4 kV, Criteria B
2. Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3)
Level-3, Criteria A
3. Fast Transient (IEC 61000-4-4)
Power : +/- 2 kV, 100 kHz , Criteria A
4. Surge (IEC 61000-4-5)
Power : +/- 1kV, Criteria B
5. Conducted Immunity (IEC 61000-4-6)
Power : 10 Vrms, 0.15 – 80 MHz, Criteria A
6. Power Frequency Magnetic Field (IEC 61000-4-8)
10A/m Continuous, Criteria A
7. Voltage Dips (IEC 61000-4-11)
Dips : 0%-40%-70%-80%, Criteria A
Interruptions : 0%, Criteria B
8. Dry Heat Test : IEC60068-2-2, Continuous Operations at 55 Deg C
9. Damp Heat Test : IEC60068-2-78, 95% RH at 40 Deg C
10. Radio interface measurement as per CISPR 22.

22. Routine/Acceptance Tests:All routine tests shall be carried out by the component manufacturer in accordance with the applicable IEC/IS standards. The manufacturer routine test reports shall be made available at the time of the factory acceptance test for evaluation and comparison.

22.1 Distribution Transformer :

1. Measurement of winding resistance
2. Measurement of voltage ratio and check of voltage vector relationship
3. Measurement of impedance of voltage , short-circuit impedance and load loss
4. Measurement of no-load loss and. Current
5. Separate-source voltage withstand test.
6. Induced overvoltage withstand test

22.2 Following routine Tests for Completer Power distribution Box shall be type carried out as per relevant IS/IEC standards,

1. AC High Voltage Test at 2.5 /3 KV, 50 Hz for 1 Minute.
2. Measurement of Insulation Resistance Test as per IS
3. Design, dimation and Visual check
4. Communications and Interfacing Test – Verify that all interconnected systemcomponents, such as data acquisition, control, monitoring, and data management functions are operating properly when correctly connectedDCU Functionality verification – Verify that all system functions of DCU are workingnormally as set forth in the contract (For Ex. Data acquisition form Energy meter,Data Acquisition by Wi-Fi Module and Other Provisions,etc.)
5. Verification of operations&default Protection threshold limits verifications
6. Test for Web Dashboard data availability as per Json Format (instantaneous, BillingData, Load survey, and Temper data)
7. Temperature rise test on one sample of each rating
8. Any other tests not specified above but covered as per amendment/ latest edition of relevant IS/IEC.

23. UAT:User Acceptance Test: The successful bidder shall confirm the User acceptance test (UAT) of the complete System within 30 days after the commencement period.The UAT comprises of installation and commissioning of one intelligent distribution box at site of pilot project, The various operational efficiency parameters, and other monitoring tools in terms of SCADA and web portal base shall allwill be tested. Any modification if required in software output reports, dashboard,intervals, data volume, integration of the system, etc. shall require to be completed withinthis period.

24. Inspection

1. The supplier shall prepare a prototype and offer the same for inspection and approval beforetaking upmass production.
2. All routine & acceptance tests and inspection of material shall be carried out at the place of the manufacturer.
3. The supplier shall offer an inspection of the material at his works before dispatch. If required thesupplier shall also offer inspection of manufacturing painting and assembly processes and qualitycontrolsystem. If any material is not found in line with relevant specifications the supplier shall modify and offer for re-inspection.
4. Inspection and acceptance shall not absolve the supplier of his responsibility to supply the thematerial inaccordance with the specifications. The purchaser reserves the right to reject thematerial notconfirming the relevant specification.

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5. The successful bidders should manufacture 1 No. of prototype Power Distribution Box of 3 KVA transformer rating type as per the specification and keep ready at their works for the purpose of sample inspection and testing.

25. Packing and Dispatch: The material to be supplied shall be packed and dispatched only after inspection and approval. The supplier shall be responsible for packing, transporting and delivery to the consignee. Copies of the packing list and inspection report duly approved shall be sent along with each consignment

26. Quality Control: The bidder shall submit with the offered Quality assurance plan indicating the various stages of inspection, the tests, and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-suppliers works to carry out inspections.

27. SMC BOX:

- 27.1 SMC box shall be anti-corrosive, dustproof, rustproof, shockproof, self-extinguishing property, resistant to heat, vermin & waterproof, Ultra Violet Stabilized and pilfer resistant Meter Box made from Glass Reinforced Polyester Sheet Moulding Compound (SMC) conforming to IS: 13410 (1992) and IS14772:2000.
- 27.2 SMC Box shall be molded in a single piece forming the body of SMC the box with a Page cover fitted with base by minimum three nos. concealed stainless steel hinges. The lid/cover shall rest on the collar of the SMC box base in such a way that any access from outside is not possible. The stainless steel hinges shall be fitted with the SMC Box body base and cover rigidly, thereby making the SMC Box pilfer resistant.
- 27.3 The door in a closed position should be overlapped in such a manner that no direct entry or access is possible. The SMC meter Box shall be closed by S.S. 'U' Clamp of minimum 0.8 mm (+/- 0.1 mm) thickness for holding and locking of the door with body base. The "U" Clamp shall have a 4 mm diameter hole through which it is possible to seal the box for sealing purposes.
- 27.4 The top surface of the SMC meter Box shall have a little tapering shape towards both sides of the SMC meter Box for easy flow of rainwater.
- 27.5 The service cable entry and exist in the SMC shall be provided with the proper size of holes for easy work on-site conditions. The holes are provided with Flexi glands so that once the service cable is installed no further external access to the SMC. The

SMC shall be also designed to mount the GPRS antenna such that only nob of the antenna shall be exerted from the SMC. However, no external access to the components of the WDD is possible. Wooden Particle board should be provided to facilitate easy & faster mounting of components of WDD.

27.6 Earth bolt of 6mm diameter x 25mm length with 2 nos nuts and 2 nos washers shall be provided. The earthing arrangement shall be of M.S. with Zinc Passivated.

27.7 All corners of the meter box should be round & not pointed ones. All metal parts shall be zinc passivated.

27.8 The box shall have a window of size 110 X 120 mm(Approx.) provided with internally fitted glass of 3 mm thickness as shown in the drawing. The glass shall be fixed from inside without any hardware exposed at front. The door shall open from right to left at 90 degree.

27.9 The SMC box shall have a adequate space and provision to fit single pole SMC of rating up to 32 A.

28. Technical specifications of other components:

The detailed technical specifications for single-phase static energy meter, SMC Box, and PiC type earthing are separately enclosed as per following annexures of this tender

Sr No	Description	Annexure No.
1	Technical specifications for 1.5 meter long, ready capsule, Maintenance free PiC type earthing	Annexure No. 1
2	Drawing of SMC Box for remote diapply Unit	Annexure No. 2
3	Technical specifications of Uni directional, Single phase energy meter, 5-30 A, with RS 485 Modbus communication	Annexure No. 3
4	The register address mapping of single phase energy meter.s	Annexure No. 4

ANNEXURE – A
Guaranteed Technical Particulars for DCU / BMU
(To be furnished by the Manufacturer)

IoT based DCU/SCU GTP		
Sr no	Details	Bidders Compliance for DCU
1	Make & Model Name	
2	3 Phase Power Supply with Isolation	
3	RS485 Communication Ports	
4	Ethernet Communication Port: (Nos)	
5	Dual SIM GPRS (Yes /No)	
6	RTC with Battery Back-Up and GSM Sync provision	
7	Digital Inputs (Nos)	
8	Relay Outputs, 5 A, 230VAC/30VDC (Nos)	
9	Analog Inputs, 0.1% FSR, 24-Bit ADC (Nos)	
10	EMI/EMC Compliance (Yes/No)	
	a. IEC61000-4-2	
	b. IEC61000-4-4	
	c. IEC61000-4-5	
	d. IEC61000-4-6	
	e. IEC61000-4-8	
	f. IEC61000-4-11	
11	IoT Communication Protocol	
12	JSON Message Format attached (Yes/No)	
13	SD Card Storage capacity (GB)	
14	History Back Fill (Yes/No)	
15	Periodic Push Data (Yes/No)	
16	On-Demand Read and Write (Pull) (Yes/No)	
17	Events and Notifications (Yes/No)	
18	Remote Configuration (Yes/No)	
19	TLS based encrypted communication (Yes/No)	
20	Battery backup provision for reporting Power loss (Yes/No)	

21	Local Calculations capability for diagnostics and performance (Yes/No)	
22	Protections provided	
23	Power consumption	
24	Protection IP	
25	Maximum and Minimum Operating temperature	

ANNEXURE – B GTP OF Complete Power Distribution Console

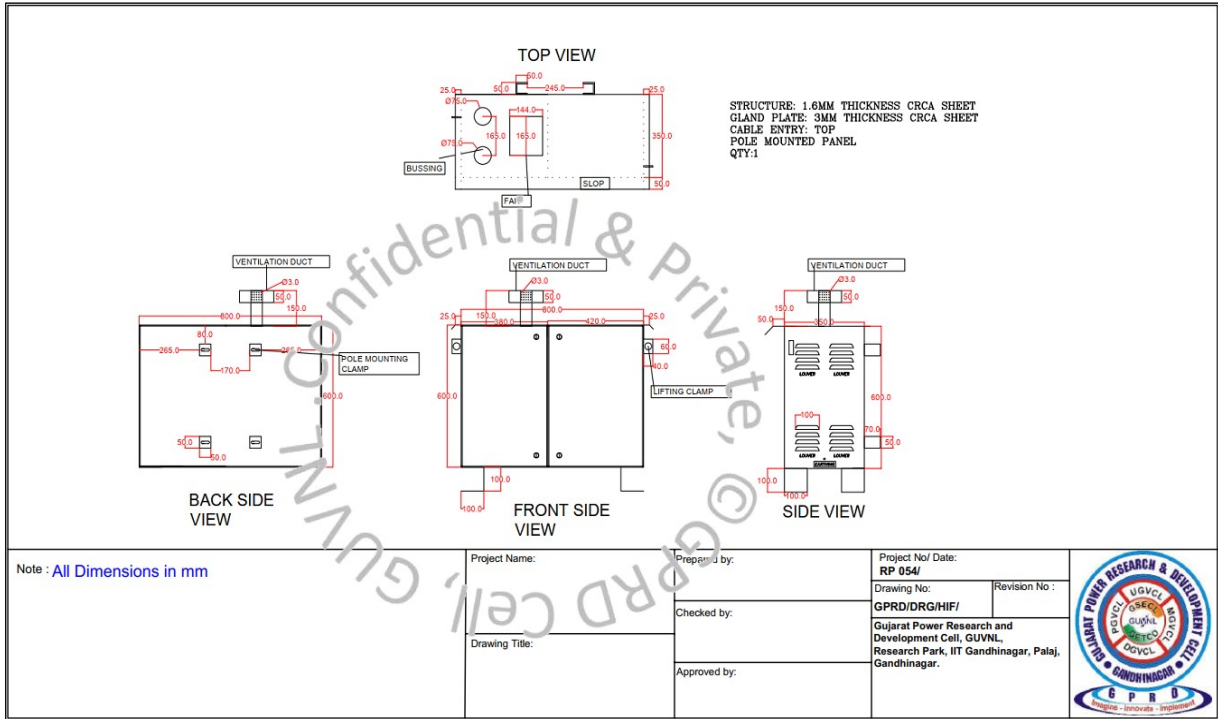
Power Distribution Console GTP			
Sr no	Details	3 KVA distribution Box	5 KVA distribution box
1	Name or Trademark of Manufacturer.		
2	The material for construction of Distribution Console		
3	The thickness of CRCA sheet / M.S.sheet for enclosure		
4	The thickness of CRCA sheet for doors		
5	Dimensions of Enclosure		
6	IP Rating of Enclosure		
7	Weight of empty enclosure/Full Enclosure		
8	Nos of Hings Per Door		
9	Type of Locking Arrangement		
10	Colour of Enclosure		
11	Details of painting		
12	Size of Phase bus bar/Neutral Bus Bar		
13	Type and Size of cable –Transformer to LV Compartment		
14	Type and size of control cable		
15	Rated Temperature rise at full loading condition.		
16	How many 1 phase, the static meter can accommodate in the enclosure		
17	Make, Type and Amp ratings of the relay		
18	Type of Connector used for service wire termination and its amp rating		
19	LCD Display unit dimensions		
20	LCD Display unit power consumption		
21	LCD Display unit –display Type & Mode		
22	MCB make & rating for each consumer (A)		

ANNEXURE – C GTP of Distribution transformer

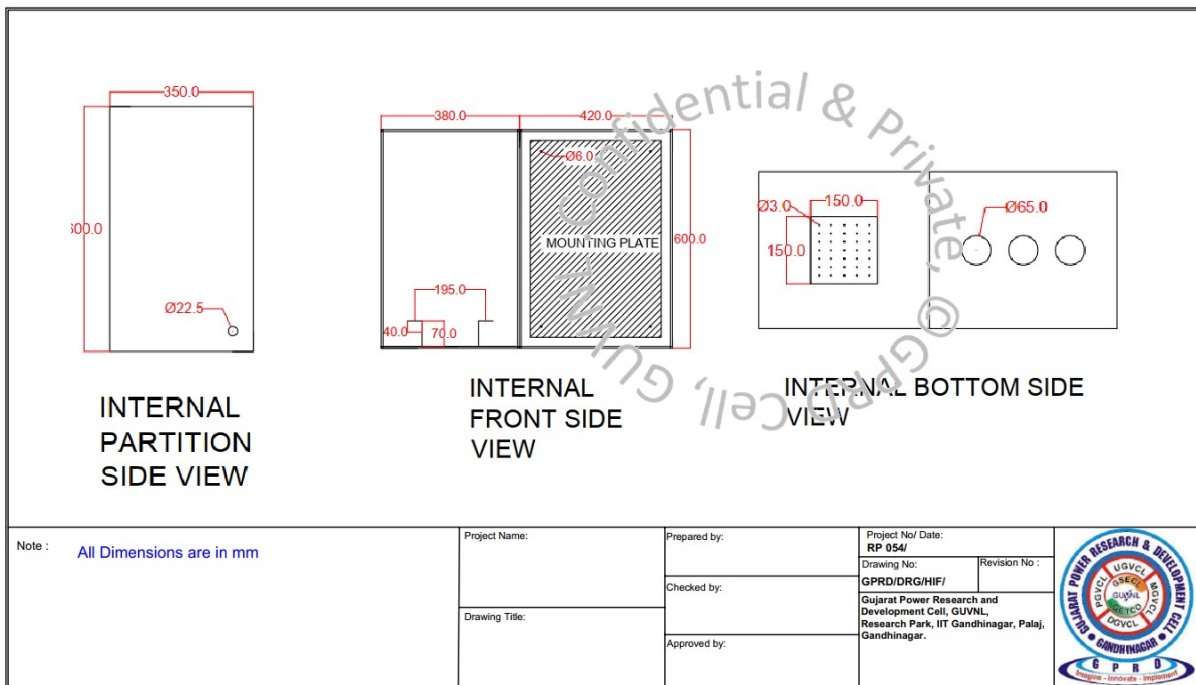
Sr no	Details	3 KVA	5 KVA
1	Name of the manufacturer and place of manufacturer		
2	Continuous max. Rating as per this specification.		
3	No load voltage ratio of the transformer		
4	Rated frequency (in Hz)		
5	Nos of phase (HV/LV)		
6	Type of Cooling		
7	Connections (HV & LV Winding)		
8	Max. Current density in Windings.		
	a.HV- Amps/sq.mm		
	b. LV- Amps/sq.mm		
5	Max. Hot Spot Temp. ^o C.(Ambient air temp. on which above is based)		
6	Max. Winding Temperature at an ambient temp.		
7	No Load losses at Rated voltage (watts)		
8	Full Load losses at 75 ^o C (watts)		
9	Total Losses at 50% load (watts)		
10	Total Losses at 100% load (watts)		
11	Efficiency at normal voltage (UPF)		
	a. At 50% Load		
	b. At 75% Load		
	c. At full Load		
12	Efficiency at normal voltage (0.8 PF)		
	a. At 50% Load		
	b. At 75% Load		
	c. At full Load		
13	% Impedance voltage at normal ratio between HV & LV winding		
14	Type of transformers, shell type / core type wound core		
15	Type of Insulation used in a) HV Winding b) LV Winding		
16	Type of Insulation used in a) Core bolts b) Core bolt washers c) End plates d) Core lamination		
17	Impulse test voltage level HV Windings LV Windings		
18	Weight of Insulated Conductor a) HV (Min.) Kg. b) LV (Min.) Kg.		

19	Weight of Core (Min.) Kg.		
20	Weight of complete transformer arranged for transport. Kg.		
21	Resistance at rated current & Frequency at 75 DegCel (a) H.V. (B) L.V		
22	Conductor Area HV –sq.mm LV-sq.mm		
23	Current density of windings at rated KVA HV –Amp/ sq.mm LV-Amp/ sq.mm		
24	Current in the winding at rated KVA HV –Amp LV-Amp		
25	Number of turns HV- LV-		
26	Power frequency withstand test voltage (in KV rms for 1 min) 1. Dry 2. Wet		
27	% Permissible Overloading with duration		
28	Winding Conductor HV LV		
29	Minimum Clearance 1. Between Phase- HV & LV 2. Phase to ground –HV & LV		
30	Insulation class of winding Insulation material		

Drawing No-1 (Outer View of the Enclosure)



Drawing No-2 (Internal View of Enclosure)



Drawing No-3 (Internal wiring Diagram)

