<u>NOTICE INVITING TENDER</u>

(Tender invited through e-Tendering mode only)

For

Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM

<u>No. RECPDCL/TECH/AMI-CED/e-Tender/2017-18/5325 Dated: 16.12.2017</u>

REC Power Distribution Company Limited

(A wholly owned subsidiary of REC, a *'Navratna CPSE'*

Under the Ministry of Power, Govt of India)

<u>Corporate office</u>

REC Power Distribution Company Limited,

A-10, 4th Floor, Sector-1 Noida - 201301,

Uttar Pradesh, India

Website : www.recpdcl.in

Description of task, Pre-qualifying criteria, e-tender submission format and procedure is available on RECPDCL website (www.recpdcl.in), REC website (www.recindia.com), Central Publication Portal (www.eprocure.gov.in)

Important Dates for E-Tendering mode	
Date of Release of NIT	16.12.2017
Last date for queries / seeking clarification	20.12.2017 at 1030 Hours
Pre Bid Meeting	20.12.2017 at 1100 Hours
Last date of submission of Tender	03.01.2018 at 1500 Hours
Date of Opening of Technical bid	03.01.2018 at 1600 Hours
Date of Opening of Financial bid	To be intimated later

<u>Note:</u>

Online registration shall be done on e-tendering website i.e. www.tenderwizard.com/REC & in general, activation of registration may takes 24 hours subject to the submission of all requisite documents required in the process.

-Sd-

(Salil Kumar)

Addl. C.E.O.

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SECTION-l

TENDER INFORMATION

Name of the assignment:

Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM.

Important information

Si. No.	Event	Information to the agencies
1	Date of Release of NIT	16.12.2017
2	Last date for queries / seeking clarification	20.12.2017 at 1030 Hours
3	Pre Bid Meeting	20.12.2017 at 1100 Hours
4	Last date of submission of Tender	03.01.2018 at 1500 Hours
5	Date of Opening of Technical bid	03.01.2018 at 1600 Hours
6	Date of Opening of Financial bid	To be intimated later
7	Pre- Bid Meeting Address	REC Power Distribution Company Limited, A-10, 4th Floor, Kribhco Bhawan, Sector-1, Noida - 201301, Uttar Pradesh, India Telefax : 0120 - 4383783
8	Tender Documents	The details can be downloaded free of cost from the websites www.recpdcl.in (or) www.recindia.com (or) www.eprocure.gov.in (or) www.tenderwizard.com/REC
9	Earnest Money Deposit	Rs 6,93,800/-
10	Estimated Cost of Work	Rs. 24.38Crores
11	Address for Bid submission	Shri. Salil Kumar, Addl. Chief Executive Officer, REC Power Distribution Company Limited, A-10, 4th Floor, Kribhco Bhawan, Sector-1 Noida - 201301, Uttar Pradesh, India. Email- ced.projects@recpdcl.in
12	Contact Person	Shri. Sunil Bisht , Deputy Manager (Technical) REC Power Distribution Company Limited (RECPDCL) Phone:0120-4383759 Email-ced.projects@recpdcl.in

Earnest Money Deposit ("EMD") is to be submitted by all the participating bidders in the form of demand draft of an amount of Rs 6,93,800/- (Rupees Six Lakhs Ninety Three Thousand and Eight Hundred Only) of any schedule Indian bank in favor of REC Power Distribution Company Limited, Payable at New Delhi. The EMD of unsuccessful bidder will be returned within 180 (One Hundred Eighty) days from the contract and EMD of successful bidder will also be returned after acceptance of work order and submission of PBG (Performance Bank Guarantee) i.e. 10% of the Contract Value.

➢ The bid shall remain valid for a period of 180 days from the last date of bid opening.

SECTION-II

PREFACE

Chandigarh Electricity Department ("CED") has recently awarded Smart Grid Pilot Project Works under National Smart Grid Mission ("NSGM") to M/s REC Power Distribution Company Limited ("RECPDCL").

Chandigarh is a union territory in the northern part of India that serves as the capital of the states of Punjab and Haryana. The Local Distribution of electricity in Chandigarh was taken over by the Chandigarh Electricity Department from PSEB on 2nd May, 1967. Chandigarh Electricity Department is responsible for Transmission and Distribution of power supply up to consumer's door-step for making quality and continuous power supply available to each and every resident.

Distribution system at Chandigarh has AT&C losses of 14.63%. There are areas which can be improved using Smart Grid technologies:

i. Online visualization of energy consumption up to consumer level.
ii. Continuous two-way communication facility between utility and consumers.
iii. Monitoring of Outage & Quality of power up to consumer level.
iv. Online information for utilization of assets like distribution transformer, LT lines etc.
v. Preventive maintenance of distribution transformer.
vi. Control and monitoring of sub-station equipment.

The scope of services includes implementation of reliable, secure and economically viable Smart Grid technologies which broadly categorized as mentioned below.

i. Advanced Metering Infrastructure (AMI)
ii. Sub-station Automation System(SAS)
iii. Integration of Roof top solar through net meter
iv. Distribution Transformer Monitoring Unit

Smart Grid technologies, which would facilitate efficient, accurate & effective online recording & monitoring of the energy exchanges in distribution system to reduce operational errors viz. reading error, bias error, typographical errors etc. caused by involvement of human element.

i. Timely raising of bills;
ii. Actuate empowerment of consumers to participate in the energy management process;
iii. Implement technologies that will help in proper monitoring of assets for extended life;
iv. Efficient system operation by better load management;
v. Tempers and alarms monitoring.;
vi. Online energy audit to overcome theft problem;
vii. Enable high level of customer satisfaction and increased awareness;
viii. Planning for new electricity connections;
ix. Utilization of renewable resources towards sustainability & green energy benefits by net metering;

Smart Meters and AMI communication systems shall be installed for 29,433 consumers scalable to approx. 2,00,000 consumers, which will include 100 nos. of Smart Meters with net-metering feature. IT infrastructure consisting of Servers, MDAS, MDAM and SCADA software etc. shall be installed in control Centre for monitoring, collection of data, storage and analysis.

This RFP is being floated on behalf of CED to appoint System Implementation Agency (SIA) for Supply, Implementation & Maintenance of Communication system or AMI for Smart Grid Pilot Project at Chandigarh Electricity Department (CED).The activities for BA are described in the detailed scope of work.

<u>Profile of UT Chandigarh</u>

1. Demographic Stats

Table 1 - Demographic statistics

Location	Area in sqkm	Population (Nos.)			Population Density (Nos./km^2)
		Total	%Urban	%Rural	
Proposed Project Area, Chandigarh	32	2.5Lacs (approx.)	80%	20%	7812

 # above data is only for reference and may vary in actual

2. Chandigarh Electricity Department (CED) has decided to implement a pilot smart grid project in operation subdivision no. 5 comprising of Sector 29,31,47,48. Industrial Area Phase-I and Phase-II, Ram Darbar Phase I &Phase II, Vill. Halomajra, Behlana ,Raipur, Bairmajra, Faidan, Makhanmajra, BRD Airforce station which is named as project area. Map of the proposed project area is shown in Figure 1.
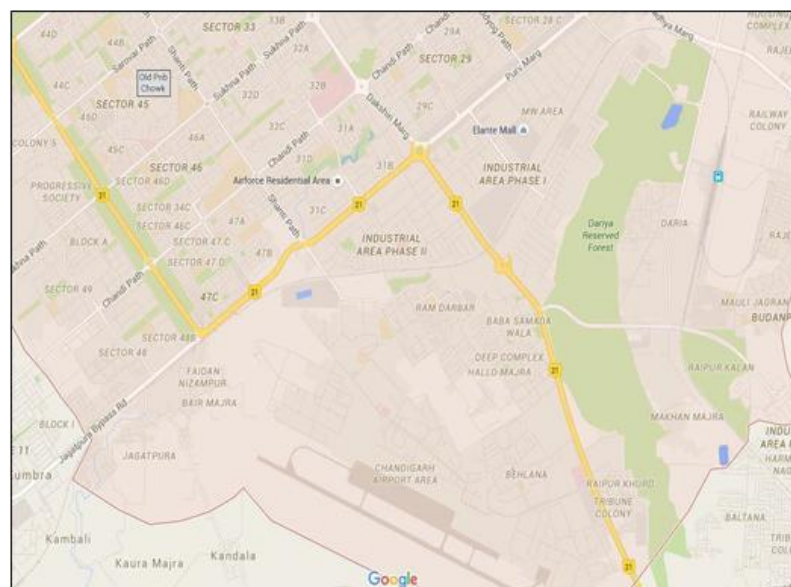

Figure 1

3. Electricity Profile of UT Chandigarh

The electricity profile of Chandigarh, in the year 2014-15 is as under:

1. The peak demand of Chandigarh Electricity Department is around 282 MW which is being met from different Central/State Generating stations.
2. UT Chandigarh has no generating capacity of its own.
3. At present, the City is receiving 47% of its power through Mohali (PSEB), about 3% through Dhulkote (BBMB) and remaining 50% through Nalagarh.
4. The city has a transmission network which comprises of one no. 220 kV Sub Station at Kishangarh Manimajra, 11 nos. 66 kV Sub Stations and 6 nos. 33 kV Sub Stations.
5. At present the city has 2,00,000 consumers which includes 1,72,653 domestic consumers, 21,428 commercial consumers and about 2,300 industrial consumers.
6. The average power requirement is around 32.49 lac units per day.
7. UT has an allocation of 166 - 236 MW of power from different Central/State Generating Stations during different hours of the day.
8. Per capita consumption is 1168 units per person per annum.
9. Besides this, Chandigarh administration is maintaining 19437 numbers of street light points within sectors roads.

4. Electricity Profile of Project Area

Existing electrical network in the project area is as follows:

1. The peak demand (met) of project area is around 65 MW which is being met from different Central/State Generating stations.
2. Peak demand timings of the project area in summer season is from 1500 to 1600 hrs. and from 2200 to 2300 hrs.
3. Identified project area for Smart Grid implementation in UT Chandigarh has 17,490 nos. of single phase, 11037 nos. of three phase and 906 nos. of CT operated three phase consumers.
4. The average energy requirement in project area is around 400 MU annually.
5. There are six (06) nos. substations in the project area which include one (01) no. 66/33/11 kV substation, one (01) no. 33/11 kV substation and four (04) on. 66/11 kV substations.
6. Total number of DTs in the project area is 402 with 1,06,500 KVA transformation capacity.

SECTION-III

INSTRUCTIONS TO BIDDERS

3.1 Submission of Bid

Agency shall submit their responses online through e-tendering website www.tenderwizard.com/REC

A. The submission and opening of Bids will be through e-tendering process.

Agency can download Bid document from the RECPDCL web site i.e. http://www.recpdcl.in or portal.recpdcl.in or www.recindia.com or eprocure.gov.in and e-tendering regd. link is given in RECPDCL website i.e. www.tenderwizard.com/REC

(Note: To participate in the e-Bid submission, it is mandatory for agency to have user ID & Password. For this purpose, the agency has to register them self with REC PDCL through tender Wizard Website given below. Please also note that the agency has to obtain digital signature token for applying in the Bid. In this connection vendor may also obtain the same from tender Wizard.)

Steps for Registration

(i)   Go to website http://www.tenderwizard.com/REC
(ii)   Click the link 'Register Me'
(iii) Enter the details about the E-tendering as per format
(iv) Click 'Create Profile'
(v)   E-tender will get confirmation with Login ID and Password

Note- Online registration shall be done on e-tendering website i.e. www.tenderwizard.com/REC & in general, activation of registration may takes 24 hours subject to the submission of all requisite documents required in the process. It is sole responsibility of the bidder to register in advance.

B.   Steps for application for Digital Signature from Bid Wizard:
        Download the Application Form from the website http://www.tenderwizard.com/REC free of cost. Follow the instructions as provided therein. In case of any assistance you may contact RECPDCL officers whose address is given at the Bid.

        Bid to be submitted through online mode on website www.tenderwizard.com/REC in the prescribed form.

C.   In case of Consortium, the bid should be submitted through Digital Signature of Lead Bidder only. Bids submitted through digital signature of any other consortium partners is liable to be rejected.

D.   The Agency qualifying the criteria mention in Section VI should upload Bid document with duly signed scanned soft copy of the documents given below for the prequalifying response:

Pre- Qualifying Criterion Documents/Technical Bid

1. Form-I------------Letter of submission of Tender
2. Form-II ------------Pre-Qualifying Criteria Details
3. Form-IV -----------Format for No-Deviation Certificate
4. Form-V ----------- Manufacturer Authorization Form
5. Form-VI ---------- Format of Curriculum Vitae
6. Form-VII ---------- Letter of Transmittal
7. Form-VIII ---------- Format for Integrity Pact
8. Annexure-A ----- Performance Bank Guarantee
9. Annexure-B ----- Acceptance form for participation in reverse auction event
10. Annexure-C ----- EMD Bank Guarantee
11. Annexure-D ----- Consortium & OEM Structure
12. Annexure-E ----- Document Indexing
13. Annexure-F ----- Self Assessment of Technical Marks
14. Annexure-G ----- Mandatory Technical Compliance by the bidder
15. EMD of Rs. 6,93,800/- in form of DD or Bank Guarantee may be drawn from a scheduled commercial bank in favour of The "REC Power Distribution Company Ltd", New Delhi and scanned copy to be uploaded and original to be submitted before the last date & time of Submission of Tender.
16. Documents required in supporting of pre-qualification criteria details.

Financial Bid
1. Form-III---------Financial Proposal (to be submitted through online mode only)

Financial bid to be submitted in the specific format designed same may be downloaded from website www.tenderwizard.com/REC and after filling the form it is to be uploaded through digital signature. The documents should be addressed to:

Addl. Chief Executive Officer
REC Power Distribution Company Ltd.,
A10, 4th Floor, Kribhco Bhawan, Sector-1,
Noida - 201301

(Note: All papers that comprise the Bid document of the concerned Bid must be numbered. An index of each page should also be provided)

SECTION-IV

OBJECTIVE, SCOPE OF WORK & SERVICE LEVEL AGREEMENT

A. AMI Program Objectives

In addition to meeting the CED's objectives with respect to energy efficiency and conservation, the AMI Program is one of CED's key strategic initiatives in support of our grid modernization vision.

AMI's key strategic objectives include:

1. Achieve Operational Efficiencies: improved reliability and lower operating costs in areas such as meter reading, distribution system maintenance, and outage management.

2. Protect Revenue: reduced revenue loss due to the theft of power directly from the distribution grid and tampering with the meters, as well as revenue "leakage" in some customer processes.

3. Keep Customer Bills Low: achieving the conservation benefits, operational efficiencies, and revenue protection lead to utility rate reductions which translate directly into customer savings.

4. Improve Customer Service: provide real-time and detailed information on consumption and cost, and enable better customer communication around outages.

5. Achieve Conservation and Energy Efficiency: energy and capacity savings achieved through time-based rates, effective communication and incentives to customers, customer direct control of energy use, and grid operational improvements.

6. Achieve Environment and Social Benefits: facilitating customer conservation, energy efficiency, reduced greenhouse gas emissions, and improve safety for employees and the public.

7. Support Advanced Customer Applications: provide a substantial portion of the foundational infrastructure required to modernize the grid in support of advanced customer applications such as distributed generation, electric vehicles, demand response, micro-grids, and future applications. Smart Meter Interface is a key, but not sole, enabler of these advanced applications.

   These additional features should also be considered

   ✓ Energy audits can be done at distribution transformer level to check theft
   ✓ Load pattern of individual consumer can be observed
   ✓ Withdrawal of power above sanctioned load may be checked

（REC POWER DISTRIBUTION logo top right）

✓ Tampering may be checked in near real time
✓ Control actions from control centre for load curtailment may be taken
✓ Remote connection / disconnection is possible
✓ Sending alert to consumer for higher load withdrawal, bill non-payment etc. is
✓ possible
✓ For variable pricing, signal transmission is possible

B. Definitions

Since the technology and naming conventions may vary between different bidders of Smart Meters, AMI &RF Mesh systems, it is important to highlight the terminology that is used in this document. However, the bidder is free to use their own conventions as long as it is properly defined in the technical proposal with reference to the definitions below:

NODE: This is essentially the end-point device of AMI and other Field applications. This device will offer wireless connectivity upstream to Collectors/Extender Bridges and/or Gateways. For example, in AMI application, the smart meters with embedded RF modules are Nodes themselves and will form a Mesh amongst themselves.

REPEATER / ROUTER: A Repeater/Router will be an intermediate aggregation point which will wirelessly connect downstream to the Nodes in its vicinity and to Gateways upstream. The Repeaters will form a Mesh amongst themselves to reach the Gateway either directly or via hops in the Mesh.

DCU/GATEWAY: A Gateway is the device that will connect Smart meters to CHANDIGARH ELECTRICITY DEPARTMENT (CED)'s Head end system/MDAS through GPRS. It will have wireless connectivity upstream to the HES and wireless connectivity to Nodes and Repeaters either directly or via hops in the Mesh.

SINGLE & THREE PHASE METER: Smart meter as per IS 16444 for LTCT and Whole current meters. (As per latest version of applicable IS).

NET METERS: HT Net meters as per latest Net Metering regulations issued by Govt. of India.

MDMS: Meter Data Management System

From now onwards CED will be used as an abbreviation for CHANDIGARH ELECTRICITY DEPARTMENT at various places.

C. Scope of work

For the deployment of smart metering throughout its territory, CED is in the process of building a RF communication network covering approx. 30,000 Smart meters across 32 Sq. Km of its service area sub division – 5 proposed for pilot. The scope of work includes:

1. Design, supply, installation, testing, commissioning and FMS of Smart Meters, AMI system& RF Mesh with a network platform that can support multiple applications like AMI, Net metering over a single communications platform.
2. Selected bidder will propose & establish the solution initially for approx. 30,000 consumers but it should be horizontally & vertically scalable to cover the entire utility consumers i.e. approx. 2.0 Lakhs to be complied strictly by bidder.
3. Site survey for identification of network design (equipment locations etc.) and detailing out comprehensive bill of material.
4. Development of communication interface module for other field equipment's including Smart meter data flows from Meter Endpoints to HES to MDMS as per frequency defined in SLA.
5. Supply, installation and commissioning of MDMS suitable for CED and its integration with existing IT system.
6. Installation, commission and integration of RF Network, Meters and MDMS for smooth functioning of AMI.
7. Training to CED staff and associated documentation for all deployed systems to ensure a smooth transition from deployment to post-deployment operations and maintenance of the system. Scope also includes training to CED's staff and associated documentation for all hardware / software updates as and when required.
8. CED's goal is to deploy its chosen system across its entire service territory for 2.0 Lakh meter/end points.
9. The purpose of this RFP is to find a suitable technology solution to meet CED's requirements that provide for some level of future proofing, while at the same time dealing with the company's specific issues relating to revenue protection and last mile connectivity.
10. The bidder shall provide comprehensive deliverable details for successful execution of the project such as H/w, s/w, tools etc. as desired by CED in this document.
11. The bidder must also specify the degree of redundancy kept while designing the system for self-healing features to be effectively working and the performance parameters those that capture this commitment consistently. 99% of Communication NIC cards in the network should be accessible from HES at any point of time. Bidder should design the system accordingly.
12. The bidder shall confirm that, the HES has sufficient logic driven smoothening built in features, for example: reliably determining current status of a meter once an outage alert is received from the meter, as well as, ability to suppress or filter false positives from outage and restoration notifications. There should be provision for deploying more such user defined logics.
13. The bidder shall confirm that, the bandwidth made available by the Ministry of communications for this purpose, shall not in any way limit or hamper the performance of both the AMI & other applications running concurrently on the same communication canopy as well as supporting other Smart grid applications.

14. Bidder to submit it's after sale service support plan and escalation matrix in order to meet contractual obligations and performance guidelines. Preferably, bidder should have service office in Chandigarh, once PO is awarded. The bidder should have minimum 5 technical persons on roll of the company having relevant experience. CV of employees to be submitted along with the bid.

15. It would be the responsibility of the bidder to integrate their NIC module with various meter OEM's. Necessary agreement must be executed at their end as per requirement In future, it would be bidders' responsibility to integrate new meter or any other application/equipment as decided by CED, in RF canopy network.

16. Bidder to also indicate timeframe for developing solution with meter and other application equipment's / OEM's. As per CED, the desired timeline shall not exceed 4 months.

17. The bidder shall confirm that offered RF canopy solution and associated network elements including NIC should be tuneable over a frequency range from kHz to GHz so that in future if allocated bandwidth is increased or if new frequency band is allocated to Power Utilities by statutory authorities, then the offered communication hardware which will be installed at site or inside the Smart meter in the form of a NIC, would not become obsolete and shall be capable to interoperate with any new environment.

18. Interoperability for AMI shall be achieved through incorporation of the communication modules (NICs) of the technology service provider inside the Smart meters of various makes of Smart meters, short listed for this purpose as of now & in future also for next 15 years.

19. The bidder shall ensure the possibility of up-gradation of the Firmware / software in the communication modules/devices from remote from time to time to meet the increasing demand of the system in operation / overcoming system limitations / bugs. The bidder shall also ensure incorporation of new hardware (communication devices, meter, NIC etc.), if required, in future. The bidder therefore shall ensure that all such upgrades shall seamlessly fit into the existing end to end system in operation and shall be backwardly compatible to the earlier generation devices / software / Firmware in operation to guard against obsolescence at no cost to CED.

20. The bidder shall spell out the time duration required and associated success rate in case of OTA firm-ware up-gradation on number of meters/communication devices simultaneously, well in advance, from the design stage and shall also ensure that all these Access points & Nodes to be used in the system shall have more than adequate memory capacity for the Firmware upgrades to happen smoothly, and securely, meeting the possible changing enhanced expectations of the next 15 years, as well as, avoiding overwriting operations during the Firmware upgrades, thus avoiding obsolescence of the hardware installed at site in quick time.

21. The network canopy shall be designed in such a way that it can accept improvements based on the experience / performance / new expectations/need from time to time.

22. Bidder to commit that the communication media is transparent and shall be exclusively used for data transfer of CED and that capacity can be allocated such that it will not be used for any other purpose without any consent from CED. Bidder shall submit corporate principal certificate for adherence of this clause.

23. The bidder shall guarantee for providing service & expansion support in the aforesaid area (at least for backward compatibility) for at least 15 years.

24. Bidder must submit a certificate on company letterhead, stating that the bidder hasn't been blacklisted by any institution/ organization/ society/ company of the Central / State Government ministry/department, or its public sector organizations during the last five years, with company stamp and signed by authorized signatory.

25. The offered solution including (H/w, s/w, OS, licenses & others) shall have life cycle of 7 years from post go Live.

26. Specifications of hardware shall be provided along with bid and Manufactures authorization for warranty & guarantee shall be in Name of CED.

27. RF network shall provide unified level of signal strength without discrimination of Network topologies in licensed area.

28. Bidder shall provide 3rd party security audit certification after go live.

29. Bidder shall replace upgrade or replace third party equipment free of cost in case the support on said equipment is withdrawn by respective OEM during this period i.e. declared as End of support by OEM.

30. Vendors to submit its experience / credentials for integrating its solutions with multiple applications used in power distribution utility nationally / internationally for solution scalability, ease of integration point of view.

31. For product Maturity, Vendor to submit performance certificates from customers (power distribution utility national / international) along with their contact details for their experience on the solution implemented in their utility – CED should be free to get in touch with them for clarifications, if needed.

32. Offered solution to comply with the existing IS standards for applications as mentioned in RFP & its Feasibility to change / modify the offered solution based on changes happened in standards in future.

33. Proven solution/reference Worldwide – Bidder to submit supporting documents reference where bidder equipment is installed, commissioned and running successfully, CED reserves the right to visit the site to ascertain bidder's capabilities. Bidder shall facilitate such visits at the client site. Travelling and lodging, boarding cost will be borne by CED however all local travel expenses, relevant permissions shall be arranged by the bidder. An undertaking to the same along with proposed client sites for visit needs to be submitted in this regard.

34. CED reserve the right to review integration mechanism along with prices of NIC card with Smart meters after every 2 years.

35. The NIC card /communication module ceiling price shall be revised after every 2 years period subject to market price.

36. The NIC card /communication module price will be mutually decided between meter OEM and bidder subject to ceiling price offered to CED by the bidder.

37. Submission of Documents
    In addition to the document as required in QR section following additional documents are to be submitted along with the offer by the bidder(s):
    ▪ Network design report of proposed solution for entire geographical area of CED with tentative placement of offered network elements
    ▪ Detailed specification & Guaranteed Technical Particulars of devices / hardware to be used

- All necessary test Certificates & licenses wherever applicable
- Point by point clarification of the RFP
- GTP & deviation sheet

38. Total devices required for roll out after complete RF Engineering

- The "Written Undertaking" document
- The Technical deliverable document
- Declaration by the bidder as per this document
- The detailed Commercial offer in tabular form encompassing various options, covering all possible items (in a separate sealed envelope)
- Suggested SLA documents
- Security write-up
- All Type Test certificates & clearances from Legal/Regulatory bodies

There are other administrative expectations such as maintenance of local warehouse(s) at Chandigarh for storage of communication devices, checking by CED & subsequent distribution to end users. Factory Acceptance Tests shall be carried out on features & functionalities as decided by CED from time to time and the communication devices shall be accepted if it remains within the acceptance criteria. Depending upon deployment terms and other conditions, pertaining to handling & delivery, shall be detailed and discussed subsequently with the selected bidders before commercial bidding process for final roll out.

39. Maintenance of the Network during Rollout

- All network communications equipment shall support local (on-site) and remote (system head end) non-intrusive diagnostics capable of detecting any abnormal operating parameters including, but not limited to, network communications, memory failure, power supply degradation, microprocessor failures (e.g. Computer Operating Properly watch dog events), firmware/software problems, excessive device temperature, SNR degradation etc.
- Transition period for end Point will be considered as 1-month post installation.
- It will be the responsibility of bidder to maintain SLA after 1 month of installation of any end point. However, during this transition period, the bidder should ensure monthly billable read to ensure that communication of end point is well established using the offered solution.
- Transition period will be considered as 3 days post installation of other network elements except smart meters. On expiry of transition period for network elements SLA will be applicable.
- Rollout period will be considered from date of deployment of the network to deceleration of post go live.

40. It shall be the responsibility of solution provider to resolve any communication and IT Infrastructure related issues of meters and IT Infra of different OEMs. Failure Rate: Less than 0.75% failure rate per annum for all network communications equipment over the required operating life (i.e. 10 years) of the system. (Failure is defined as any occurrence when the equipment is not functioning per design specification).

41. Less than 1.5% failure rate per annum for all network communications equipment over the extended operating life of the system. (Operating life and extended life of the equipment is typically defined by contract between the utility and the communication equipment supplier.

42. The network solution provider shall ensure that latest network security methodologies and controls are exercised fully and not diluted at any point of time.

43. The network solution provider shall ensure two-way communication success rate, for both AMI & operational applications and response time within 6 seconds for operations of demand response and switching of electrical devices with a success rate of 99%-, consistently.

44. The network solution provider shall ensure Turn Around Time (TAT) for response in the following manner under service disruption.

    a. Over and above the criterion mentioned in this document, CED reserves the right for prioritisation of any issue at any point of time.

    b. The bidder shall submit a report on the network status on daily, weekly and monthly basis, even when the system is not covered under FMS, so that; proactive responses may be generated for the betterment of the system.

    c. Penalties shall be there when the performance of the system shall be below the threshold parameter, as mutually agreed and documented, which will be judged on the availability of AMI & DA data availability over a period.

45. Applicable Standards, Frequency and Statutory Approvals

    a. The system and all individual equipment must comply with all relevant statutory requirements and regulations that are set by government authorities, such as the Wireless Planning & Coordination (WPC) Wing of the Ministry of Communications and Information Technology. Wireless technologies need to comply with the Indian statutory bodies that govern communication related aspects such as WPC (Wireless Planning Co-ordination wing) which oversees licensing and management of all wireless spectrums in India. Equipment Type Approval (ETA) is to be obtained for communication modules as per Department of Telecom, Government of India requirements. Radio emission characteristics for the chosen band shall comply with latest NFAP and the G.S.R (General Statutory Rules) notifications from Department of Telecom, Government of India.

    b. All documents demonstrating compliance, approval and usability must be submitted by the bidder along with the technical proposal after award of contract. Failure to do so may result in bid disqualification. Any statutory clearances related to installation will be in CED's scope but has to be facilitated by the bidder.

    c. The RF Mesh Communication Devices shall comply to the following standards: IEEE 802.15.4 – IEEE standard for Information Technology – Telecommunications and Information Exchange between Systems – Local and Metropolitan Area Networks – Specific Requirements Part 15.4: Wireless Medium Access Control (MAC) and Physical layer (PHY); IEEE 802.15.4g – IEEE Standard for Smart Utility Networks or any other equivalent standard /alliance.

    d. The bidder to submit relevant certification in order to validate the conformance and interoperability of their IEEE 802.15.4 and IEEE 802.15.4g or equivalent implementations.

    e. If the proposed solution operates in licensed frequency band, bidder to attain the required license on behalf of CED for entire geographical area of CED for 15 years. Cost of procuring license and license fee for next 15 years will be in the scope of bidder.

D. Approach and Methodology

1. <u>COMMUNICATION CANOPY</u>

CED intends to set up a communication canopy over any of the unlicensed frequencies in India (865-867 MHz/2.4 GHz /5.8 GHz etc.) or licensed wireless band, spread across its total pilot project area of 32 sq. km, for AMI applications. RF canopy network should be designed to cater data requirements of 2,00,000 Smart meters. RF canopy should be designed to operate at minimum 50 % of designed capacity (peak data requirement with guaranteed performance) for full scale deployment and balance capacity shall cater to performance expectations during difficult & challenging times and also for meeting future applications.

CED envisions that the last mile communication infrastructure thus created shall be scalable over the air for supporting more end-point deployments and other applications in future. The system shall become fully operational in the next 1.5 years and shall consequently not be affected by obsolescence.

Pictorial representation of proposed connectivity between end point devices and Control Centers is as shown below Figure 2
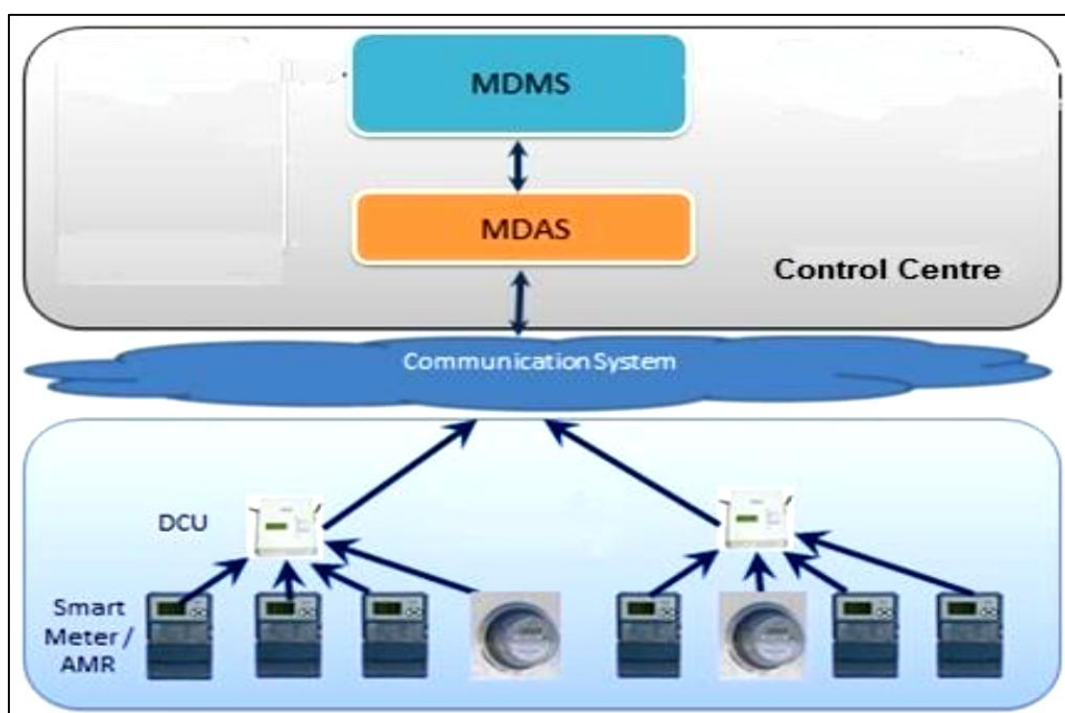
Figure 2

The RF canopy thus established, using wireless technology, shall be in the form of a RF mesh with field devices like nodes, routers/repeaters, collectors/gateways etc. and Meters forming the mesh & operating in a licensed / unlicensed frequency band. For solution on licensed band, frequency license should be approved by Ministry of IT & Communications, Govt. of India for use in Power Utility. These devices shall facilitate a network infrastructure which can be distributed over a large span of distance covering the entire licensed area of CED.

The Collector/Gateway/Repeaters/Extender Bridge units are to be installed at a suitable maintainable height primarily on CED owned properties so as to have a maximum coverage area. Bidder may also envisage to utilize mobile towers of service providers for installation of network elements at bidders cost. In case bidder use 3_{rd} party mobile towers for creating RF canopy, bidder is required to submit documentary proof for back to back arrangement with tower owner for entire duration of project i.e. 15 years. The communication network shall be reliable, scalable and shall have facility for auto registration and self-healing. Tripartite agreement will be execute between utility, bidder and ISP as per the guidelines of TRAI (if required)

It should be fault tolerant & "sleepy" in nature to optimize on resources. Suitable network management system (NMS) shall also to be provide to monitor the performance of the communication canopy round the clock from the Control Centre of CED. The NMS shall provide view of all the networking elements deployed at site and enable configuration, parameterization of the networking devices and the nodes over the air. The communication network may also have to support other communication technologies (Ethernet/cellular) for specific need based isolated deployment and if so, this shall have to be integrated into the same HES for ease of operation. Bidder to share capability of the offered solution and components including future product roadmap (support for Ethernet and cellular).

Functional Specification
Functional specification outlines the requirement & expectation of CED w.r.t. the establishment of an integrated end to end last mile multi-application communication canopy suitable for seamless data transfer between Smart Meters/ end point devices of different makes and respective Control Centers of Advanced Metering Infrastructure.

The scope of the RFP also includes RF engineering study of the pilot project area (Sub Division-5) of CED by the bidder. A report to be submitted to CED along with the bid clearly specifying the quantity and type of the communication devices required for erecting the multi-application communication canopy over the entire area both for DA/ AMI & other applications, keeping in mind that the deployment shall be done phase wise, need based and in highly scattered nature. Submitted report will be evaluated and shall be considered in evaluation criterion.

CED will provide the necessary latitude & longitude of all the relevant substations/ assets, CED establishments and other information as decided to facilitate bidder. However, it will be the responsibility of bidder to make necessary site visits & ensure that proposed solution will work as per SLA terms mentioned above.

For any further details regarding location of end points, bidder may do site visits under intimation to CED office.

Bidder to submit point wise detailed description of questionnaire on Approach and methodology to be followed for developing RF canopy after award of work before commencement of work and approval:

S.No	Question	Bidder Response
1	Please describe RF communications canopy architecture for the proposed applications mentioned in the scope of RFP, starting from the head end system and ending with the different endpoint. If licensed frequencies are used, please include details for the acquisition of these frequencies and any support provided. Please include standards used in this communication architecture.	
2	Please provide information on the RF and EMF emissions and the impact of the AMI technology on the public. Has your company participated in any studies or conducted studies related to this impact? How have customer issues been resolved? Include any whitepapers or studies as an attachment.	
3	Please provide communications deployment guidelines for the proposed system based on specific system restrictions, requirements, and limitations. Also provide guidelines for number and location of collector and/or repeater devices.	
4	If the proposed AMI communications is an RF mesh technology, please describe the overall mesh recommended operating parameters including any limitations on the number of hops for network efficiency. If other RF technology, please describe the limitations and recommendations to obtain optimum network coverage and capacity.	
5	If the system is deployed according to recommendations for collector locations, optimum hops, optimum poll rates, etc., what is the expected data throughput of the deployed network? Throughput claimed should be demonstrated at field /FAT. What is the impact of changes in the network topology on the data throughput? NOTE: Data throughput is the amount of data that can be transmitted through the network accounting for collisions, overhead and data retries.	
6	Please describe the expected operational capabilities and limitations that would exist a single / multiple network element becomes non-operational for any extended period of time. What data collection limitations would exist? What are the capabilities and limitations to recover data from the meters associated with such failure?	
7	Bidder has to study the requirement for RF mesh, design, supply, erection & commissioning of all the equipment's & auxiliaries for deployment of RF mesh. Describe how the utility ensures that the number and location of the network equipment is sufficient to meet the performance and coverage requirements and additional equipment will not be required to achieve the required level of performance.	
8	All ongoing support & maintenance activities required for the communication infrastructure equipment such as batteries, comm. card, etc. will be covered in FMS.	

9	The timing required to complete a disconnect or reconnect operation for the proposed applications mentioned in the scope of RFP should be as per SLA. Does this include a confirmation of successful disconnect or reconnect? Is a separate request to the end point required to validate successful disconnect and reconnect?
10	If the system is deployed according to recommendations (network elements installed according to network plan) and the system is collecting daily data according to recommended poll rates, how much of the total bandwidth is available for other operations? At what bandwidth utilization does the network cease to be functional?
11	Does the communications technology support prioritization, such as control commands will be transmitted with a higher priority than read requests? If so, please describe.
12	Describe what tools, reports and capabilities are included in the head end software to support the management and troubleshooting of the communications infrastructure? Provide samples where possible.
13	Describe the roles and skill sets required for the maintenance of the communications infrastructure
14	Do you provide software and hardware tools for the field technicians to support the troubleshooting and testing of the communications equipment and the communications network? Please describe all tools (hardware and software) available for the testing, verification, configuration and evaluation of RF canopy. Do you provide required software & hardware tools for field technicians to read data from meters/ routers & also controlling of meters (sending reconnection/disconnection command) from field using portable devices?
15	Is there any current or pending litigation with respect to the proposed communication technology? This litigation could be with respect to ownership rights to the technology or with respect to alleged harmful effects of the technology. Please describe in detail any such litigations and the impact to CED. Bidder to provide a certificate stating that no litigation is pending.
16	Describe the upgrade and maintenance process and capabilities for the communications network. How is firmware updated in the communication network equipment? Can components of the network equipment be upgraded in the field? What is the bidder policy when components in the network are no longer available?
17	Are there any alternative tools for communication with the end points and network elements (other than through the installed RF canopy)? Is there a tool for collecting information from one or end points & network elements, for scenarios where the network is unavailable or non-operational? Please describe
18	Describe prioritization mechanism of data flow for different applications
19	Are meters permanently connected to the communications medium or is a connection established on an 'as required' basis? If the meters are not

	permanently connected what mechanisms are used to initiate communications? Please describe.
20	How many concurrent meter – Head-End communications sessions can be supported at any one time. What is typical data rate in kbps for a meter to Head-End communications? Please describe
21	The Bidder shall provide a listing of all known sources of interference to the proposed technology solution such as cellular systems, wide-area data networks, distribution automation systems, power line carrier systems, etc.
22	Please describe Interference Management: The system shall not cause any harmful interference to other systems. The bidder shall resolve any impact with other parties as needed.
23	Radiation Exposure: The AMI supplier shall ensure that their devices and installations are within the acceptable human exposure limits per international standards/WPC norms and as required for the utility service territory. Please describe
24	Embedded firmware and software shall be configurable and upgradeable locally and remotely & notification should be sent to HES as well as local device. Please describe.
25	The equipment should be certified by international accreditation bodies. Relevant certificates need to be provided.
26	Data Storage and Extraction: - All network communications equipment shall utilize non-volatile memory for storing and retaining data. Data storage shall be sufficient to provide redundancy for one full billing cycle i.e 30 days for all meters under this device. - All network communications equipment shall provide a means for extracting stored data directly from the device in the event of network communications or equipment failure. (Using local device Firewall protected RF/ RS 232/ Ethernet)
27	Network Equipment Battery Replacement: If it is necessary to replace network equipment batteries within the required operating and extended operating life of the system, the battery shall have a life expectancy of at least 10 years. The AMI supplier shall provide detailed estimates of the number of estimated replacements along with diagnostics and battery replacement instructions and estimated labour and equipment costs (time and materials) required to perform these replacements. Replacement of any battery will be under FMS.
28	Installation of meters will not be in scope of bidder. However discovery and any other troubleshooting for communication to the extent of replacing of NIC card in field will be in the scope of bidder.
29	Bidder to provide detailed project execution plan within two weeks award of PO for RF mesh, design, supply, erection & commissioning of all the equipment's & auxiliaries for deployment of RF mesh.
30	Bidder to provide the details of the conditions in which smart meter cannot be a

	part of RF mesh.	
31	Bidder to share the drawings of mounting arrangements of network elements and should get it approved from CED after award of PO. Bidder should also supply the As-Built Drawings of network once erection phase is over.	
32	Bidder are encouraged to review the CED network area through Google map for understanding of RF network layout however CED shall share list of administrative offices, premises wherein data collector can be installed based on Bidder network plan.	
33	RF network creation is sole responsibility of bidder thus any addition of new equipment's like repeaters, Head end, DCU, RF routers shall be inclusive part of Network designing & deployment to meet the performance criteria.	
34	Due to development of any external infrastructure which may hamper the performance of RF shall be relocated and deployed without cost implication during FMS and warranty.	

2. <u>SMART METERS AND AMI IMPLEMENTATION</u>

Meters
Bidder to supply following type of Smart Meters as per mentioned BoQ.

Type of Meters
1. Single phase whole current Smart Meter
2. Three Phase whole current Smart Meter
3. Three Phase whole current Smart Meter (Net-Meter)
4. Three phase CT operated Smart Meter
5. Three phase CT operated Smart Meter (Accuracy class of 0.2 for 66kV, 33kV & 11kV feeder line and Accuracy class of 0.5 for Distribution Transformer)
6. Feeder Meter

2.1. SINGLE PHASE WHOLE CURRENT SMART METER
    2.1.1. SCOPE

This specification covers the technical requirements of design, manufacturing, testing & integration with network integration card(NIC) of RF communication to be used at CED for LT Single phase two Wire, 10-60 A static smart meters of accuracy class 1.0 (here after referred as meters) complete with all accessories for efficient and trouble free operation. It is not the intent to specify completely herein all the details of technical design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in 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 Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

    2.1.2. APPLICABLE STANDARDS

The equipment covered by this specification shall conform to the requirements stated in latest editions & amendments of relevant Indian/ IEC Standards and shall conform to the regulations of local statutory authorities.

Table 2 - Applicable Standards- Single Phase Smart Meters

a	IS 16444 Part-1 : 2015 and part-2: 2017	A.C. Static Direct connected Watt hour Smart meter class 1.0 and 2.0
b	IS 13779 : 1999	A.C. Static Watt hour meter class 1.0 and 2.0
c	IS 15884 : 2010	A.C. direct connected static prepayment meters for active energy (class 1 & 2)
d	IS 15959 Part-1 : 2011	Data exchange for electricity meter reading, tariff and load control
e	IS 15959 Part 2 : 2016	Data exchange for electricity meter reading , tariff and load control
f	IEEE 802.15.4 : 2016	Standard for local and metropolitan area networks
g	IS 9000	Basic Environmental testing procedure for electrical and electronic items.
h	IEC 62052-11 : 2003	Electricity Requirements (AC) General Requirements Tests and Test conditions for A.C. Static Watt hour meter for active energy Class 1.0 and 2.0.
i	IEC 62053-21 : 2003	A.C. Static Watt hour meter for active energy Class 1.0 and 2.0
j	IS 15707 : 2006	Testing Evaluation installation and maintenance of AC Electricity Meters- Code of practice.
k	IEC 60068	Environmental testing.
l	CBIP–TR No.325	Specification for A.C. Static Electrical Energy Meters (latest amendment)
m	CEA Regulation : 2006	Installation and operation of meters Dated: 17/03/2006 or latest amendment

2.1.3. CLIMATE CONDITIONS OF THE INSTALLATION

Table 3

Max. Ambient Temperature	50^0C
Max. Daily average ambient temp.	40^0C
Min Ambient Temp	0^0C
Maximum Humidity	95%
Minimum Humidity	10%
Average No. of thunderstorm days per annum	50
Maximum Annual Rainfall	750mm
Average No. of rainy days per annum	60
Rainy months	June to October
Altitude above MSL not exceeding	300 Meters
Wind Pressure	126 kg/sq m up to an elevation at 10 m

2.1.4. GENERAL TECHNICAL REQUIREMNTS

2.1.4.1. Type of the meter

Single phase two wire, static watt-hour direct connected type smart meter without application of any Multiplication Constant. It consisting of measuring elements(s), time of use of register(s), display, load switch and plug in type bi-directional communication module all integral with the meter housing.

2.1.4.2. Accuracy Class of the meter

Accuracy Class of the smart meter should be 1.0

2.1.4.3. Basic Current (Ib) & rated Maximum current (Imax)

a) Ib   = 10 Amp;

b) Imax   = 60 Amps;

(Meter shall be able to continuously carry 120% of Imax Meeting the accuracy requirements).

2.1.4.4. Reference Conditions for testing the performance of the meter

a) Vref   = 240 V ± 1 % as per IS 13779

b) Frequency   = 50 Hz ± 0.3%

c) Temperature   = 27 C ± 2 0C

2.1.4.5. Operating Voltage

Meter shall be operational with required accuracy from 0.6 Vref to 1.2 Vref. However, meter shall withstand the maximum system Voltage of 440V (for minimum 5 min).

2.1.4.6. Operating Frequency

Required operating frequency should be in the range of 50 Hz ± 5%.

2.1.4.7. Power Consumption

a) Voltage circuit   : Maximum 5.0 W and 15 VA

b) Current Circuit   : Max 4VA

(The additional power requirement during data transmission shall not exceed 7W per communication module).

2.1.4.8. Starting Current

20mA (0.2% of Ib) (phase or neutral current)

2.1.4.9. Short time over current

1800 A for 0.01 sec (30 Imax for one half cycle at Rated frequency)

2.1.4.10. Influence of heating

Temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature at 50^0C.

2.1.4.11. Rated Impulse Withstand voltage

6KV (shall be applied ten times with one polarity and then repeated with the other polarity.)

2.1.4.12. AC withstand Voltage

4 KV for 1 Minute Minimum

2.1.4.13. Minimum Insulation resistance

Minimum Insulation resistance at test voltage 500+/- 50 V dc

a) Between frame & current, voltage circuits as well as auxiliary circuits connected together: 5 M Ohm

b) Between each current (or voltage circuit) & each and every other circuit.: 50 M Ohm

2.1.4.14. Mechanical requirements

Meter shall be in compliance with clause 12.3 of IS 13779

2.1.4.15.   Resistance to heat and fire

The terminal block and Meter case shall ensure safety against the spread of fire. These should not get ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 13779. Fire retardant material shall be used.

2.1.4.16.   Protection against penetration of dust and water

Degree of protection: IP 51 as per IS 12063, but without suction in the meter. Meter shall comply with clause 6.9 and 12.5 of IS 13779

2.1.4.17.   Resistance against Climatic influence

Meter shall be in compliance with clause 12.6 of IS 13779.

2.1.4.18.   Electromagnetic Compatibility (EMC)

Meter shall be in compliance with clause 4.5 and 5.5 of IS 15884

2.1.4.19.   Accuracy requirements

Meter shall be in compliance with clause 11 of IS 13779.

2.1.4.20.   Power factor range

Zero lag to Zero lead.

2.1.4.21.   Energy measurement

Fundamental energy +Energy due to Harmonics

2.1.4.22.   Connection Diagram

The connection diagram for the system shall be provided on terminal cover.

2.1.4.23.   Self-Diagnostic feature

The meter shall have indications for unsatisfactory /non-functioning of

a) Real Time Clock

b) RTC battery

c) Non Volatile Memory

d) NIC card

2.1.4.24.   Initial start-up of meter

Meter shall be fully functional within 5 secs after reference voltage is applied to the meter terminals.

2.1.4.25.   Alternate mode of supply to the meters

In case of meter damage, reading/data should be retrieved with the help of battery or other power source. (Bidder to be provide free of cost 04 nos of jig for retrieving data from memory of meter. Jig should be such that NVM can be push fit on this jig and data can be retrieve from this NVM).

2.1.4.26.   Sleep Mode

Meter shall not go in sleep mode. Display should not be 'off' at any point of time.

2.1.4.27.   Terminal Specs

a) Minimum Internal Diameter of the terminal holes 9.5mm (minimum)

b) Minimum Depth of the terminal holes 23 mm ($\pm$2 mm tolerance)

c) Clearance between adjacent terminals 10 mm (minimum)

2.1.4.28.   Display

Backlit LCD, Scrolling, 10 seconds for each parameter minimum 7 digits LCD display

2.1.4.29.   Security feature

Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication, firmware selection from remote etc.

2.1.4.30. Software and communication compatibility

The bidder shall supply software required for local (CMRI) & remote (AMI) connectivity including required training to use the software free of cost.

2.1.4.31. Calibration

Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However, parameters like RTC, TOD tariff, DIP (billing & load survey), billing date, display parameters etc. shall be reconfigure through CMRI and remotely over the air (OTA).

2.1.4.32. Communication module of meter for AMI

As per clause no 1.2 (b) of IS 16444, Meter should have provision of communication module compatible with both the variant mentioned in IS 16444 PART-1. This module should be able to get connected to the NAN / WAN network of service provider (RF/ 4G) of CED, if any existing.

2.1.4.33. Communication Layer Protocol

Should be as per clause 9.3 of IS 16444 PART-1 or Latest Applicable

2.1.4.34. Key Management and Security Feature

Should be as per IS 15959 Part-1 & Part- 2 or Latest Applicable

2.1.4.35. Usage Application

Indoor and Outdoor usage

2.1.4.36. Disconnector

The meter shall have the facility of disconnecting and re-connecting the load of the meter from the remote and by authenticated command through Laptop/HHU at site by means of a built-in contactor. This operation shall be conducted with the help of a third party software which is owned by CED and in addition to the manufacturer's own software, both in RF / RF Mesh with fall back provision on Cellular (GPRS/ 3G / 4G / LTE) which can be given through optical port using external modem by utility.

Each operation of the switches shall be logged by the meter as an event with date and time stamp and reading parameters. This operation should be in line with clause 11 of IS 16444 PART-1, however over current tripping should be disabled by default. The cumulative no. of such operations shall also be made available.

The make of the load switch should be of reputed make like Grooner (German) or equivalent and same shall be confirmed by the bidder during tendering. Switch shall be in compliance to IS 15884.

The brief technical particulars of this Disconnector / load switch are furnished below: -

Table 4 - Disconnector Specification

S.No.	DESCRIPTION	Requirement
1	Operating Voltage range	130 V to 440V
2	Operating Current range	20 mA to 72 A
3	Maximum switching power	22 kVA per phase/ per IS 15884 Annex G
4	No. of poles	2 nos (one in phase and one in neutral)
5	Operation of switches	Simultaneous
6	Utilization Categories	UC2 or better
7	Min. number of operation	3000 (close, open each)

2.1.4.37. Communication capabilities and software feasibilities

a) The meter shall have facilities for data transfer locally through CMRI (Using optical port/NIC card) and remotely by RF / RF Mesh with proper security via Plug in type NIC.

b) It should be the responsibility of the bidder to ensure integration of meter into HES (Supplied by RF communication provider) of existing RF-mesh network system of CED, (if Exists). For cellular fallback, the modem / Module should have backward compatibility.

c) It shall be possible to reconfigure the meters for RTC, TOD Tariff, DIP (Demand Integration period), billing date, display parameters etc. through proper authentication process locally through CMRI and remotely over the air (OTA). Necessary keys if required for performing this reconfiguration operation should also be provided along with supply of meter lot & training to CED staff on how to use it free of cost. Bidder to provide this support on a later stage also on the request of CED without any cost implication.

d) Optical communication port shall be available for communication. Communication port shall not be affected by any type of injection/unauthenticated signals and having proper sealing arrangements. The complete data shall be downloaded in <10 minutes.

e) The bidder shall supply software required for local (CMRI) & remote (AMI) connectivity including required training to use the software free of cost. Bidder shall provide the communication protocol / APIs for communication with meter through local (CMRI) / remote (AMI) as and when required by CED free of cost during life time of meter. The bidder should provide DLMS compliance for Communication with the meter at Optical port and at HES.

f) Bidder should also provide software for changing firmware of meters in mass and should support integration of this software with HES. Bidder should also provide base computer software (BCS) for viewing the data downloaded through HES/CMRI/laptop/HHU in separate PC/laptop. Android based/ windows/Linux based HHU shall be preferred. API required for converting raw file to XML. (DLMS/OBIS) should also be provided if applicable.

g) For purpose of exercising control, like outage management, the meter should send abnormalities at the consumers' end like Power failure (Last Gasp), Power Restoration (First Breath). Additional exceptional events should also be communicated to HES by meter immediately after the occurrence through RF / RF Mesh. It should also indicate the restoration of the same event. List of events to be reported should be configurable over the air(OTA). The meter should have "Last Gasp" and "First Breath" feature to facilitate sending alerts to the HES during fully powered off / On condition.

h) Two way communications between:
   a. Base Station (HES) and Data Concentrator Unit (DCU) shall be through RF/ Fiber / Ethernet or any other suitable media, depending upon suitability and choice of CED.
   b. Meter and Intermediated Communication Network Elements (if Exists) and/or Data Concentrator Unit through RF/ Hybrid (combination of RF)

    c. Intermediated Communication Network Elements (if Exists) and Data Concentrator Unit (if different & if applicable) through RF/ Hybrid (combination of RF.

i) Last mile mesh network must support auto-registration and self-healing feature to continue operation using easiest possible available route in case of failure of any communication device in the mesh.

j) Meter Serial no will be used for tagging of all data of the meters in all database (at HES / MDM/ DCU level etc.). However, it will be the responsibility of the Bidder to establish the complete communication solution involving all the meters in the system. Also, the Bidder must ensure that, the mode of communication used for RF shall be consistent with the Government of India stipulations.

k) Integration of meter software's with HES / MDMS for seamless transfer of data will be in scope of bidder till the expiry of warranty of the meters. It is desired firmware up gradation/selection should be available over the air.

l) Bidder has to ensure that meter supplied by him will be compatible with RF solution and MDMS supplied by him.

m) Communication of the meter should be as per IS 15959 (Part-2):2016 or latest applicable amendment.

n) Band usage range is 865-867 MHz with +/- 2 MHz or License Band with 10 years of license.

o) Communication network should be immune with any external Magnetic field/ESD/Jammer/HV voltage influence such that it shall not affect the normal overall functionality.

p) Meter once powered up with NIC card should be self-detected by RF network and its basic name plate details & current readings should be transferred to HES.

2.1.4.38. Immunity against external influencing signals

a) Magnetic Field:

    i. Meter shall record accurate energy in case of any external influencing signals in line with IS 13779:1999 Cl.11.2 and variation in limits of error (unto 100% Imax) shall be as per the table 17 of IS 13779. Meter shall be immune to magnetic field such that it shall not affect the normal overall functionality However, in case of abnormal magnetic field as defined below meter shall perform as per the following features:

    ii. Meter shall log the event in its memory as "Magnet" with date and time stamp threshold values as per Table 5 - Tamper Event Details for Single Phase Smart Meters.

    Abnormal Magnetic field is defined as below:

    a) Continuous DC magnetic induction: >0.20 Tesla ± 5%(Value of the magneto motive force to be applied shall be generally >17500 ATs, should be immune up to 0.27Tesla)

    b) AC magnetic induction: Immune for 10 Milli Tesla (if produced with circular metal core with square cross section as specified in CBIP latest report with 2800 AT) / >0.2 Tesla ± 5% (if produced with 14 SWG 25,000 AT air cored magnet as specified in CBIP Technical report no-325).

c) Permanent Magnet: Immune up to 0.5T and Event logging >0.5T.

d) In all above conditions the Recording to shift on I max and logging in events. The thresh hold values as mentioned in Table 5 - Tamper Event Details for Single Phase Smart Meters.

b) Electrostatic Discharge (ESD)

Meter shall be immune up to 8 kV and shall record accurate energy as per IS-13779:1999/CBIP-325. Meter shall log the event into memory as 'ESD' with date & time stamp for any ESD greater than 8 kV with snap shot of Voltage, Phase current, Neutral current, Energy KWh, KVAh and Instant PF. However, in case of ESD application, the meter shall perform as per the following features:

i. Meter shall log the event in its memory as" ESD" with date and time stamp threshold values as per Table 5 - Tamper Event Details for Single Phase Smart Meters

ii. The shielding around the meter shall be such that it does not get affected by high Voltage and high energy or low energy impulse when comes in contact with meter from any side. Meter should immune to jammer.

iii. Meter shall latch & store all the tampers events which have occurred/stored in memory of meter from the date of energization till life of meter. Total tamper storage should be as per Table 5 - Tamper Event Details for Single Phase Smart Meters.

2.1.4.39. Neutral Disturbance & other tampers

a) The meter shall log the event in memory on thresholds defined in Table 5 - Tamper Event Details for Single Phase Smart Meters.

b) The meter shall not saturate on passage of direct current, which can cause the meter either to stop recording/ record inaccurately. DC injection shall be tested both in phase and neutral. Measurement by meter shall not get influenced by injection of DC signal/ DC pulse up to 330V (both + & - DC) and for any value beyond this.

c) The meter shall record energy proportional to the current and Vref (240V) when any of the tamper circuits enclosed as per annexure-1 are used to tamper energy using a diode or a variable resistance or a variable capacitance energy saving device. The measurement by meter shall not get influenced by injection of AC Voltages/Chopped signal/DC signal/ DC pulse of low frequency and harmonics. The meter should be immune to such Neutral Disturbance. In case the meter accuracy is disturbed under Neutral Disturbance, it should be able to log the event.

d) Single Wire tamper: When neutral is disconnected from both load side and supply side, the meter should record energy as per rated parameters (Vref) & log the event. Event logging & registering of energy shall be as per Table 5 - Tamper Event Details for Single Phase Smart Meters.

e) Low voltage check- Meter should log low voltage event as per threshold in Table 5 - Tamper Event Details for Single Phase Smart Meters

f) Current mismatch - Meter should log CM event as per thresholds in Table 5 - Tamper Event Details for Single Phase Smart Meters. Priority of logging this event in memory of meter is higher than earth tamper and earth LED shall glow as per its own logic Irrespective of this logic.

g) Tamper Icon in LCD shall glow for presence of meter top cover open case.

h) The following tampers shall also be considered:

   i. Diode: Immune up to 6A,1000V and if > 6A, 1000V Logging in events with snap shot of voltage, Phase current, Neutral current, Energy KWh, KVAh, instant PF and shall show tamper in Meter Display.

   ii. Resistance: Immune up to 1K, If> 1K Logging in events with snap shot of voltage, Phase current, Neutral current, Energy KWh, KVAh, instant PF and shall show tamper in Meter Display.

   iii. Capacitor: immune up to 4.7Mf and if > 4.7Mf 1K Logging in events with snap shot of voltage, Phase current, Neutral current, Energy KWh, KVAh, instant PF and shall show tamper in Meter Display.

2.1.4.40.   Abnormal Tamper conditions

(a) Meter shall be immune to Influence of Magnet and ESD as per clause 2.1.4.38. If value of Magnet is abnormal then, "Tamper event" shall be logged and energy shall be recorded at 100% of Imax as per clause 2.1.4.38.

(b) All the tamper events i.e. Magnet/ESD/Meter Top Cover Open/Neutral Disturbance /Single Wire/Low Voltage Check/Current Mismatch/Temperature Rise/Power on-off shall be logged in the memory of the meter with date and time stamp of occurrence and restoration along with instantaneous electrical parameter (Voltage, Current (phase and neutral), energy, PF etc.) Each register compartment size should be as per Table 5 - Tamper Event Details for Single Phase Smart Meters.

(c) Tamper event logging along with values of intensity & snapshot of occurrences & restorations Table 5 - Tamper Event Details for Single Phase Smart Meters.

Note- If the meter senses or records the event above defined threshold then meter shall not be tested in higher values in our lab for particular tamper.

All tamper logging thresholds values shall be configurable from remotes.

Table 5 - Tamper Event Details for Single Phase Smart Meters

Persistence Time for Occurrences	Persistence Time for Restoration	Threshold Value for Occurrence of Events	Threshold Value for Restoration of Events	Compartment Size
ESD/JAMMER = 0 Hr 02 Min 0 sec (ESD)	ESD/JAMMER =0 Hr 02 Min 0 sec (ESD)	Immunity up to8 KV with NIC and logging of value from 1 KV to 50 KV	Removal of ESD signal	25
Magnet = 0 Hr 10 Min 0 sec(MAG)	Magnet =0 Hr 10 Min 0 sec (MAG)	> 50 mT (permanent magnet) ORDC magnetic induction >200 mT OR AC magnetic induction > 50 mT	< 50 mT (permanent magnet) OR DC magneticinduction <50 mT or ACmagnetic induction <50 mT	25
Meter Top Cover Open (TC Open)	Meter Top Cover Open(TC Open)	If meter top cover is opened	NA	05(Stay put Type)
Single Wire =0 Hr 10 Min 0 sec (SW)	Single Wire =0 Hr 10 Min 0 sec (SW)	a) At a current of >500mA under tamper condition of neutral missing (where battery is used for voltage reference). Meter will perform the fraud energy registration above 500mA assuming Vref (from battery) and UPF. b) At a current of >1 amps under tamper condition of neutral missing (where third CT is used for voltage reference). Meter will perform the fraud energy registration above 1A assuming Vref (from third CT) and UPF. c) Condition no. 38 of Annexure-1 (Timer test): The timer operation duration on/off time for 30 seconds with constant current for 30 min.	Voltage > 190 V	25

Neutral Disturbance =0 Hr 10 Min 0 sec (ND)	Neutral Disturbance =0 Hr 10 Min 0 sec (ND)	Voltage >145% of Vref Current >10% Ib OR Frequency < 47 Hz OR Frequency > 52 Hz OR DC voltage /signal injection	Voltage <115% of Vref Current > 10%Ib AND Frequency > 47 Hz OR Frequency < 52 Hz	25
Current Mismatch = 0 Hr 10 Min 0 sec (CM)	Current Mismatch = 0 Hr 10 Min 0 sec (CM)	Ip + In ≥ 20 % ofIb (vector sum) AND Ip > 20% of Ib	Ip + In < 10 % ofIb (vector Sum) AND Ip > 20% of Ib	25
Low Voltage Check =0 Hr 10 Min 0 sec (LVC)	Low Voltage Check = 0 Hr 10 Min 0 sec (LVC)	Voltage < 70% of Vref AND current > 2% Ib	Voltage > 80% of Vref AND current > 2% Ib	25
Temperature Rise = 0 Hr 30 Min 0 sec (TR)	Temperature Rise =0 Hr 30 Min 0 sec (TR)	Temperature > 100 Degree C	Temperature < 80 Degree C	25 (Stay put type)
Power On Off = 0 Hr 10 Min 0 sec	Power On Off =0 Hr 10 Min 0 sec	Actual Voltage off	Actual Voltage On	25
Over Load (If enabled) OL	Over Load =0 Hr 30 Min 0 sec (TR)	>preset value (default set at 120%)	<preset value(default value)	25

GENERAL CONSTRUCTION REQUIREMENT

The Meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially personal safety against electric shock, safety against effect of excessive temperature, protection against spread of fire, protection against penetration of solid objects, dust and water.

All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions.

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components. All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy as given below or any other equivalent make with the strict approval of Purchaser:

The successful bidder is also required to furnish details as per the table mentioned below after award of contract before commencement of work.

Table 6

S No	Component Function	Requirement	Makes and Origin(to Be provided by bidder)
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	
3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	
6.	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.	
7.	Battery	Lithium with guaranteed life of 15 years	

8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	

2.1.5. Meter Body

a) Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II) with FV0 Fire Retardant, self -extinguishing, UV stabilize, recyclable and Anti oxidation properties.

b) The minimum thickness of the meter enclosure shall be 2mm.

c) Meter base shall be opaque with polycarbonate LEXAN 500R or equivalent on prior approval from the CED.

d) Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the CED.

e) Meter cover & base shall be provided with Ultrasonic/Chemical welding/Push fit mechanism or combination in such a way that it is not possible to open the meter box without breaking (break-to-open design)the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence.

f) The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s).

g) Unidirectional screws to be used on meter covers where ever required.

2.1.6. Terminals, Terminal Block

a) Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block adequate testing of materials shall e taken into account.

b) Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the test given in ISO 75 for temperature of 180°C and pressure of 1.8 M Pa.

c) The terminal block shall be of opaque with polycarbonate LEXAN500R or equivalent on prior approval from the CED.

d) The terminals and connections shall be suitable to carry up to 120 % of I_{max} continuously (Imax 60 A). The size, design & material of Bus bar /Shunt/Terminal shall be with suitable cross sectional area so that temperature rise will not be more than 20^0C above ambient temperature of 45^0 C at 120% of I_{max} loading for 06 hrs. continuous. This test of temp. rise shall be done on tender samples & will also be done on any samples from any supplied lot.

e) To get the desired temp rise & avoid hot spots the design of each terminal screw, preferred terminal screw shall be with hex head screw / allen head screw & shall be operated with allen key or special key. The preferred Size of the allen screw shall be 6mm dia.

f) The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

g) The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Terminals shall be preferably with Allen screw with at least 6 mm dia for better contact area. Terminal & screw should not be damaged during regular opening and tightening.

h) Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

2.1.7. Terminal Cover

Terminal cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the CED. Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be approved by CED). After sealing the cover, terminals shall not be accessible without breaking the seals.

2.1.8. Sealing of meter

Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. For this, one no. Polycarbonate seal and one no. Hologram seal shall be provided by the Purchaser. One no polycarbonate seal and one no. hologram seal shall be provided by the bidder. All the seals shall be fixed on meter body by the bidder at his works before dispatch.

One sealing provision shall be provided at meter terminal cover; such that terminal shall not be accessible without breaking the seals. All the seals shall be provided on front side only and as per the Purchaser specification. Rear side sealing arrangement shall not be accepted. Bidder shall provide seals be as per CEA regulation (2006). Only patented seals to be used as per CEA requirements.

Plug in type NIC card should have proper sealing arrangement.

2.1.9. TOD FEATURE

The meter shall be capable of measuring Cumulative Energy (KWh), and MD (KW) with time of day (TOD) registers having 8 zones & 02 seasons (no. of zones & time slot shall be programmable by CMRI with adequate security level and in one to one /broadcast mode over the air).

2.1.10. MD INTEGRATION

The MD integration period shall be 30 minutes (integration period-programmable by CMRI at site and also through AMR with adequate security level). The MD resetting shall be automatic at the 1st of the month i.e. 0000 hours of 1st day of the month. Manual MD reset button shall not be available.Last six MD values shall be stored in the memory and one to be displayed in the Auto scroll mode. MD shall be recorded and displayed with minimum three digits before decimal and minimum two digits after decimal points.

2.1.11. PARAMETERS IN BCS

The parameters in BCS shall be as under

2.1.11.1. Load Survey

The meter shall be capable of recording load profile of 45 days 30 min IP for kWh, kW, Voltage and Phase and Neutral current for ON days/time.

Meter shall be capable of recording daily Energy and Demand 00:00 to 24:00 Hrs. KWh, KW in BCS for 45 days.

2.1.11.2. Instantaneous Parameters

Meter shall be capable for following Instantaneous Parameters in Memory and should be available in BCS.

Table 7

Meter S.No.	
Meter Type	
Meter date & Time	DD MM YYYY HH MM SS
MRI/PC date & Time	DD MM YYYY HH MM SS
Dump date & Time	DD MM YYYY HH MM SS
Voltage	000.000V
Phase Current	00.000A
Neutral Current	00.00A
Power factor	0.000
Instantaneous Frequency	00.000Hz
Instantaneous Load	Active
Present Cumulative Energy	Active
Cumulative Power Off Duration	00000
Cumulative Power ON Duration	00000
Cumulative Tamper count	00000
Cumulative Tamper duration	00000
Cumulative Billing Count	00000
Billing date	dd:mm:yy
No of Power failure	00000
Temperature	
Vector/phasor diagram	
No. of Disconnector operation	00000

2.1.11.3. General Information

Meter shall be capable for providing below mentioned general parameters in memory

- Meter Serial number
- Software Name
- Version
- Manufacture Name
- Manufacture Year
- Meter Type
- Meter Class
- Meter Constant
- Meter Voltage Rating
- Meter Current Rating
- TOD profile

2.1.11.4. Billing Parameters

    a) Maximum Demand (Reset date & all History, time zone register wise)

        a. MD - Abs Active Load/ kW

        b. MD - Abs Apparent/ kvA

    b) Billing Dates (06 History)

    c) Flags Description

        a. NVM

        b. RTC

        c. Battery

    d) Main Energy (Reading date & all History, time zone register wise; Minimum 6 Histories)

        a. Period

        b. Total active

    e) Consumption (Reading date & all History, time zone register wise; Minimum 6 Histories)

        a. Period

        b. Total active

        c. Power factor

        d. CMD

    f) Mode of operation of dis-connector switch

    Last ten modes with date & time of switching with energy parameters (kwh, TOD1 kwh, TOD2 kwh, TOD3 kwh)

2.1.12. Transactions

All the changes in software of meter to be logged along with date & time stamp and readings. Meter should do billing if any transaction is done.

2.1.13. Tamper Events

All the events should be logged as per Table 5 - Tamper Event Details for Single Phase Smart Meters.

2.1.14. Display Units

The display unit shall be Pin type built-in liquid crystal display (Permanently backlit type LCD). The LCD shall be of STN (Super Twisted Nematic) construction suitable for maximum temperature withstands 65^0C and minimum temperature withstands 0^0C during normal operating condition. The LCD display shall have a wide viewing angle of 120 degrees. When the meter is not energized the electronic display need not be visible. The display shall not be affected by electrical, magnetic disturbances and ESD. The display should be readable in direct sunlight. Phase Indication should be Green LED only.

2.1.15. Auto Scroll mode

Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (i.e. if MD1 is displayed in Auto scroll mode, Header (MD1) and value (say 5.23 KW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 10 secs, if push button is not operated.

Display should not be stuck for any tamper events.

Following shall be continuously displayed in auto scroll and push button mode in the given order.

Table 8

Sr. No.	Auto Scroll Display
1	LCD CHECK
2	Meter Sr. No. (Serial no. display with sequence 2 + 6 digits at a time, completer no. in single shot is preferred)
3	d- dd:mm:yy
4	t- hh:mm:ss
5	C 000000 KWh
6	000.000 Pr MD KW (Current month MD)
7	(Last month reading) 000000 KWh
8	(Last month MD) 000.000 MD KW
9	Ph 00.000 A
10	N 00.000A
11	000.000 V
12	Status of load switch(Connect or disconnect)

2.1.16. Push Button Scroll mode

Should facilitate following order

Table 9

Sr. No.	Push Button Display
1	LCD CHECK
2	Meter Sr. No. (Serial no. display with sequence 2 + 6 digits at a time, completer no. in single shot is preferred)
3	d- dd:mm:yy
4	t- hh:mm:ss
5	C 000000 KWh
6	000.000 Pr MD KW (Current month MD)
7	(Lastmonth reading)A 000000 KWh
8	(Last month MD)A 000.000 MD KW
9	Ph 00.000 A
10	N 00.000A
11	000.000 V
12	Ph 00.000 KW
13	N 00.000 KW
14	Status of load switch(Connect or disconnect)
15	MAG 00 (cumulative count)
15 a	Date of last occurrence
15 b	Time of last occurrence
16	ESD 00 (cumulative count)
16a	Date of last occurrence
16b	Time of last occurrence
17	ND 00 (cumulative count)
17a	Date of last occurrence
17b	Time of last occurrence

18	SW 00 (cumulative count)
18a	Date of last occurrence
18b	Time of last occurrence
19	TC OPEN 00 (cumulative count)
19a	First occurrence date
19b	First occurrence time
20	Total tamper count 0000
21	Reading in high resolution
22	Count of connect
22a	Date and time of last occurrence
23	Count of disconnect
23a	Date and time of last occurrence

All these parameters shall be downloaded locally or remotely and interpreted in PC/Laptop. All the parameters shall be recorded and memorized in its Non Volatile Memory (NVM). The corresponding non-volatile memory shall have a minimum retention time of 10 years. Last twelve months' history data (KWh reading and MD and event as above with date and time) shall be available in the Non Volatile Memory.

2.1.17. Output Device
a) Pulse Rate: The meters shall have a suitable test output device. Red color blinking LED (marked as imp/kWh) shall be provided in the front. This device shall be suitable for using with sensing probe used with test benches or reference standard meters. The test output device shall have constant pulse rate of (preferred value- 3200) pulse / kWh. Meter constant shall be indelibly printed on the name plate as (preferred value- 3200) imp / KWh
b) EL LCD Indicator- The meter shall be provided with suitable earth mark indicator for Earth Leakage. The EL Indicator shall glow when there is a difference of 6.25 % between phase and neutral current.
c) Communication LCD indicator- The meter shall be provided with suitable LCD indication for communication in progress.
d) Load Switch LCD indicator- The meter shall be provided with suitable LCD indication for condition of load switch (Close/open). LCD should show when load switch is open.

2.1.18. Mid Night Values
Meter should have mid night log for KWh for last 45 days.

2.1.19. Name Plate and Marking
Meters shall have a name plate clearly visible and effectively secured against removal. The base color of Name plate shall be as of CED approval, indelibly and distinctly marked with all essential particulars as per relevant standards along with the following.
(a) Manufacturer's name
(b) Type designation
(c) Number of phases and wires
(d) Serial number (Meter serial number shall be laser printed on name plate instead on sticker).

(e)   Month and Year of manufacture

(f)   Unit of measurement

(g)   Reference voltage, frequency

(h)   Ref. temperature if different from 27 deg. C

(i)   Rated basic and maximum Current

(j)   Meter constant (imp/kWh)

(k)   'BIS' Mark

(l)   Class index of meter

(m)   "Property of CED

(n)   Purchase Order No. & date

(o)   Guarantee period

(p)   Rated frequency

(q)   Sign of double square

(r)   Country of manufacture

(s)   Symbol of load switch

(t)   Communication Tech for WAN and NAN (with carrier frequency)

(u)   Communication Technology is IHD supported (with carrier frequency)

(v)   Firmware version for meter

(w)   Category

However, the following shall be printed in bar code on the meter nameplate. (Shall be printed on name plate instead on sticker).

(a)   Manufacturer's code No. (given by CED)

(b)   Meter Sr. No.

(c)   CED Property

(d)   Month/Year of manufacture.

2.1.20. TESTS

All routine, acceptance & type tests shall be carried out on the meter and meter body separately in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted in addition to the tests specified in IS/IEC.

2.1.20.1. Type Test

(a) All tests as defined in IS 16444 Part-1: 2015 /IS 13779:1999 / IS15959 Part-2: 2016 OR Latest amendment of Applicable Standard.

(b) Test against abnormal magnetic influence as per CBIP TR 325.

(c) DC immunity test (injection both on phase and neutral terminal) Test for Material used for Terminal Block and meter body as per relevant standards.

(d) IP test

2.1.20.2. ROUTINE TEST

(a) AC High Voltage test

(b) Insulation test

(c) Test on limits of error

(d) Test of starting current

(e) Test of no load condition

2.1.20.3.   ACCEPTANCE TEST

(a) AC High Voltage test

(b) Insulation test

(c) Test on limits of error with following loads

Table 10

120% I max(72A)	I max (60A)	Ib(10A)	0.5 Ib (5A)	0.1Ib (1A)	0.05Ib (0.5A)
UPF, 0.8 lead and 0.5 lag	UPF, 0.8 lead and 0.5 lag	UPF, 0.8 lead and 0.5 lag	UPF, 0.8 lead and 0.5 lag	UPF, 0.8 Lead and 0.5 lag	UPF

(d) Test of meter constant

(e) Test of starting current

(f) Test of no load condition

(g) Test of repeatability of error.

(h) Test of power consumption.

(i) Test for Immunity against external influencing signal as per the Purchaser specification

(j) Test for Immunity against DC Immunity as per the Purchaser specification

(k) Test for Immunity against Tamper conditions as per the Purchaser specification

(l) Error measurements with 38 abnormal condition(As applicable) as per Annexure -1

(m) Test to Influence of Harmonics

(n) Supply voltage and frequency variation test

(o) Testing of self-diagnostic features and tamper count increment and logging with date and time.

(p) All tests as defined in IS15959(Part-2): 2016

2.1.21. TYPE TEST CERTIFICATE

The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI as per the relevant standards. For communication testing any national approved laboratory or international acclaimed lab or equivalent will also suffice at the discretion of CED. Type test should have been conducted in certified Test Laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to CED.

2.1.22. PRE-DISPATCH INSPECTION

The successful bidder shall facilitate the pre-dispatch inspection at their works site. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment,

if found unsatisfactory as to workmanship or material, the same is liable to rejection. The decision of the purchaser shall be final in this regard.

Equipment shall be subject to inspection by a duly authorized representative of the RECPDCL. Bidder shall grant free access to the places of manufacture to RECPDCL's representatives at all times when the work is in progress. The cost of such inspection shall be borne by the Bidder. Inspection by the RECPDCL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by RECPDCL.

Following documents shall be sent along with material.
a. Govt certified/accredited lab testing certificate
b. Meter Test reports
c. MDCC issued by CED
d. Invoice in duplicate
e. Packing list
f. Drawings & catalogue
g. Guarantee / Warranty card
h. Delivery Challan
i. Other Documents (as applicable)
j. One no. leaflet with each meter

2.1.23. INSPECTION AFTER RECEIPT AT STORE

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection. The decision of RECPDCL shall be final in this regard.

2.1.24. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the purchaser up to a period of at least 60 months from the date of Project Go-Live, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the purchaser, failing which the purchaser will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the purchaser's own charges (@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

2.1.25. PACKING
(a) Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The material used for packing shall be environmentally friendly. Packing and transportation shall be as per IS 15707:206 clauses 9.1 and 9.2.

(b) Individual meter should be packed in separate box. Routine test report of the individual meter shall be kept inside each card board carton of the meter.

(c) On back side of RTC the bidder shall print a picture of the meter with its small details like for consumer to know about meter.

2.1.26. QUALITY CONTROL

The bidder shall submit with the offer 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.

Quality should be ensured at the following stages:

(a) At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.

(b) At insertion stage, all components should undergo computerized testing for conforming to design parameter and orientation.

(c) Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipment (ATEs).

(d) Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will be kept in ovens for 24 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 24 hours' meter should work satisfactorily)

The CED's engineer or its nominated representative shall have free access to the bidder's/manufacturer's works to carry out inspections.

2.1.27. MINIMUM TESTING FACILITIES

Bidder should ensure that supplier of meter should have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards/CED specification. The bidder shall have duly calibrated Reference Standard meter of Class 0.1 or better accuracy or better.

2.1.28. MANUFACTURING ACTIVITIES

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart shall be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

2.1.29. SPARES, ACCESSORIES AND TOOLS

Not Applicable

2.1.30. DRAWINGS AND DOCUMENTS

Following drawings & Documents shall be prepared based on CED specifications and statutory requirements and shall be submitted after award of contract for approval:

(a) Completely filled-in Technical Parameters;

(b) General arrangement drawing of the meter;

(c) Terminal Block dimensional drawing;

(d) Mounting arrangement drawings;

(e) General description of the equipment and all components with makes and technical requirement;

(f) Type Test Certificates;

(g) Experience List;

(h) Manufacturing schedule and test schedule;

After the award of the contract, four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval:

Table 11

S. No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	General Arrangement drawings	√		√
3	Terminal block Dimensional drawings	√		√
4	Mounting arrangement drawing	√		√
5	Manual/Catalogues		√	
6	Transport/ Shipping dimension drawing		√	√
7	QA &QC Plan	√	√	√
8	Routine, Acceptance and Type Test Certificates	√	√	√

Bidder shall subsequently provide Four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same.

All the documents & drawings shall be in English language.

Instruction Manuals: Bidder shall furnish two softcopies (CD) and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

2.1.31. GUARANTEED TECHNICAL PARTICULARS

Bidder must ensure to furnish following GTP after award of contract.

Table 12 - GUARANTEED TECHNICAL PARTICULARS (GTP)

S.No	Description	Units	As Furnished by Bidder
1	Type of meter		
2	Accuracy Class of the meter		
3	Ib & Imax	A	
4	a. Operating Voltage for meter	V	

	b. Operating Voltagewith communication unit functionality			
5	Operating Frequency	Hz		
6	Power Consumption and Burden			
7	Starting Current	mA		
8	Short time over current	A		
9	Influence of heating			
10	Rated impulse withstand voltage	KV		
11	AC withstand Voltage for 1 min	KV		
12	Insulation resistance a) Between frame &Current, voltage circuits connected together: b) Between each current (or voltage circuit) & each and every other circuit.	M ohm		
13	Mechanical requirement as per IS 13779			
14	Resistance to heat and fire (As per specification)			
15	Degree of protection			
16	Resistance against climatic influence (as per IS 13779)			
17	Electromagnetic Compatibility (EMC)			
18	Accuracy requirements (As per IS 13779			
19	Power factor range			
20	Energy measurement			
21	Connection Diagram for system on terminal cover	Yes/No		
22	Self-diagnostic feature			
23	Initial startup of meter (meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals)			
24	Terminal block			
	a)Depth of the Terminal holes	mm		
	b)Internal diameter of terminal holes	mm		
	c) Clearance between adjacent terminals	mm		
25	Communication capabilities as per clause 2.1.4.37			
26	Immunity against abnormal Magnetic influence, as defined in Clause2.1.4.38			
27	Immunity against ESD as defined in clause 2.1.4.38			
28	DC Immunity as defined in clause 2.1.4.39			
29	Abnormal and tamper Conditions as per Table 5 - Tamper Event Details for Single Phase Smart Meters	Yes/No		
30	Grade of material for a) Meter base			

	b) Meter cover		
	c) Terminal block		
	d) Terminal cover		
31	Tamper counts		
32	Recording forward energy in all conditions as per Annexure - 1(including current/potential reversal)	Yes/No	
33	Makes of all components used in the meter as per clause **Error! Reference source not found.** to be provided	Yes/No	
34	Non Volatile memory (Retention period)		
35	Measuring elements used in the meter		
36	Power supply to circuit in case of supply failure		
37	Display of measured values (As per specification – clause **Error! Reference source not found.**.28)	Yes/No	
38	LCD display (Type and viewing angle)		
39	Pulse rate	Imp/ kWh,	
40	Name plate marking	Yes/No	
41	Routine test certificates	Yes/No	
42	Acceptance test certificates	Yes/No	
43	Type test certificates	Yes/No	
44	Guarantee certificates	Yes/No	
45	Output Device (LEDs) As per clause 2.1.11	Yes/No	
46	Make of Disconnector switch		
47	Disconnector Technical particular as per Specification clause 2.1.4.36**Error! Reference source not found.**	Yes/No	
48	Terminal Screw dia.		
49	Allen Screw head size (Terminal Screw)		
50	Fire retardant category of the material a. Meter body b. Terminal block		

2.1.32. SCHEDULE OF DEVIATIONS

Bidders must submit the No- Deviation form as per the Form IV format.

2.2. THREE PHASE WHOLE CURRENT METERS (IMPORT/NET)

2.2.1. Scope

This specification covers the technical requirements of design, manufacturing, testing & integration with network integration card (NIC) of RF communication to be used at CED for three phase four Wire, 3x230 voltage, 20-100A, whole current static smart meters of accuracy class 1.0 (here after referred as meters) complete with all accessories for efficient and trouble free operation.

It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in 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 Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.2.2. APPLICABLE STANDARDS

The equipment covered by this specification shall conform to the requirements stated in latest editions & amendments of relevant Indian/ IEC Standards and shall conform to the regulations of local statutory authorities.

Table 13 - Applicable Standards- Three Phase Smart Meters

a	IS 16444 Part-1 : 2015 and part-2: 2017	A.C. Static Direct connected Watt hour Smart meter class 1.0 and 2.0
b	IS 13779 : 1999	A.C. Static Watt hour meter class 1.0 and 2.0
c	IS 15884 : 2010	A.C. direct connected static prepayment meters for active energy (class 1 & 2)
d	IS 15959 Part-1 : 2011	Data exchange for electricity meter reading, tariff and load control
e	IS 15959 Part 2 : 2016	Data exchange for electricity meter reading , tariff and load control
f	IEEE 802.15.4 : 2016	Standard for local and metropolitan area networks
g	IS 9000	Basic Environmental testing procedure for electrical and electronic items.
h	IEC 62052-11 : 2003	Electricity Requirements (AC) General Requirements Tests and Test conditions for A.C. Static Watt hour meter for active energy Class 1.0 and 2.0.
i	IEC 62053-21 : 2003	A.C. Static Watt hour meter for active energy Class 1.0 and 2.0
j	IS 15707 : 2006	Testing Evaluation installation and maintenance of AC Electricity Meters- Code of practice.
k	IEC 60068	Environmental testing.
l	CBIP–TR No.325	Specification for A.C. Static Electrical Energy Meters (latest

		amendment)
m	CEA Regulation : 2006	Installation and operation of meters Dated: 17/03/2006 or latest amendment

2.2.3. CLIMATE CONDITIONS OF THE INSTALLATION

Table 14

Max. Ambient Temperature	50^0C
Max. Daily average ambient temp.	40^0C
Min Ambient Temp	0^0C
Maximum Humidity	95%
Minimum Humidity	10%
Average No. of thunderstorm days per annum	50
Maximum Annual Rainfall	750mm
Average No. of rainy days per annum	60
Rainy months	June to October
Altitude above MSL not exceeding	300 Meters
Wind Pressure	126/sq m up to an elevation at 10 m

2.2.4. GENERAL TECHNICAL REQUIREMNTS

2.2.4.1. Type of the meter

Three phase 04 wire, static watt-hour direct connected type smart meter without application of any Multiplication Constant. It consisting of measuring elements(s), time of use of register(s), display, load switch and plug in type bi-directional communication module all integral with the meter housing.

2.2.4.2. Accuracy Class of the meter

Accuracy Class of the smart meter should be 1.0

2.2.4.3. Basic Current (I_b) & rated Maximum current (I_{max})

(a) I_b = 20 Amp;

(b) I_{max} = 100 Amps;

(Meter shall be able to continuously carry 120% of I_{max} Meeting the accuracy requirements).

2.2.4.4. Reference Conditions for testing the performance of the meter

(a) V_{ref} = 240 V ± 1 % as per IS 13779

(b) Frequency = 50 Hz ± 0.3%

(c) Temperature = 27 C ± 2 0C

2.2.4.5. Operating Voltage

Meter shall be operational with required accuracy from 0.6 Vref to 1.2 V_{ref}. However, meter shall withstand the maximum system Voltage of 440V (for minimum 5 min).

2.2.4.6. Operating Frequency

Required operating frequency should be in the range of 50 Hz ± 5%.

2.2.4.7. Power Consumption

(a) Voltage circuit   : Maximum 5.0 W and 15 VA

(b) Current Circuit   : Max 4VA

(The additional power requirement during data transmission shall not exceed 7W per communication module).

2.2.4.8. Starting Current

40mA (0.2% of Ib) (phase or neutral current)

2.2.4.9. Short time over current

3000 A for 0.01 sec (30 I_{max} for one half cycle at Rated frequency)

2.2.4.10. Influence of heating

Temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature at 500 C.

2.2.4.11. Rated Impulse Withstand voltage

6KV (shall be applied ten times with one polarity and then repeated with the other polarity.)

2.2.4.12. AC withstand Voltage

4 KV for 1 Minute Minimum

2.2.4.13. Minimum Insulation resistance

Minimum Insulation resistance at test voltage 500+/- 50 V dc

(a) Between frame & current, voltage circuits as well as auxiliary circuits connected together: 5 M Ohm

(b) Between each current (or voltage circuit) & each and every other circuit.: 50 M Ohm

2.2.4.14. Mechanical requirements

Meter shall be in compliance with clause 12.3 of IS 13779

2.2.4.15. Resistance to heat and fire

The terminal block and Meter case shall ensure safety against the spread of fire. These should not get ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 13779. Fire retardant material shall be used.

2.2.4.16. Protection against penetration of dust and water

Degree of protection: IP 51 as per IS 12063, but without suction in the meter. Meter shall comply with clause 6.9 and 12.5 of IS 13779

2.2.4.17. Resistance against Climatic influence

Meter shall be in compliance with clause 12.6 of IS 13779.

2.2.4.18. Electromagnetic Compatibility (EMC)

Meter shall be in compliance with clause 4.5 and 5.5 of IS 15884

2.2.4.19. Accuracy requirements

Meter shall be in compliance with clause 11 of IS 13779.

2.2.4.20. Power factor range

Zero lag to Zero lead. & meter shall be programed at default lag only configuration i.e. Lead to be treated as unity for kVA calculations

2.2.4.21. Energy measurement

Fundamental energy +Energy due to Harmonics (Forward Metering for Import mode and Import / Export for Net configuration)

2.2.4.22. Connection Diagram

The connection diagram for the system shall be provided on terminal cover.

2.2.4.23. Self-Diagnostic feature

The meter shall have indications for unsatisfactory /non-functioning of

(a) Real Time Clock

b) RTC battery

c) Non Volatile Memory

d) NIC card

2.2.4.24. Initial start-up of meter

Meter shall be fully functional within 5 secs after reference voltage is applied to the meter terminals.

2.2.4.25. Alternate mode of supply to the meters

In case of meter damage, reading/data should be retrieved with the help of battery or other power source. (Bidder to be provide free of cost 04 nos of jig for retrieving data from memory of meter. Jig should be such that NVM can be push fit on this jig and data can be retrieve from this NVM).

2.2.4.26. Sleep Mode

Meter shall not go in sleep mode. Display should not be 'off' at any point of time.

2.2.4.27. Terminal Specs

(a) Minimum Internal Diameter of the terminal holes 9.5mm (minimum)

(b) Minimum Depth of the terminal holes 23mm (+/- 2 mm tolerance)

(c) Clearance between adjacent terminals 10 mm (minimum)

2.2.4.28. Display

Backlit LCD, Scrolling, 10 seconds for each parameter minimum 7 digits LCD display

2.2.4.29. Security feature

Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication, firmware selection from remote etc.

2.2.4.30. Software and communication compatibility

The bidder shall supply software required for local (CMRI-conventional/RF) & remote (AMI) connectivity including required training to use the software free of cost.

2.2.4.31. Calibration

Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However, parameters like RTC, TOD tariff, DIP (billing & load survey), billing date, display parameters etc. shall be reconfigure through CMRI and remotely over the air (OTA).

2.2.4.32. Communication module of meter for AMI

As per clause no 1.2 (b) of IS 16444. Meter should have provision of communication module compatible with both the variant mentioned in IS 16444 PART-1. This module should be able to get connected to the NAN / WAN network of service provider (RF/ 4G) of CED. Meter should be able to provide required power supply to NIC card provided by communication provider recommended/approved by CED. Size /form factor of NIC card should be approved by CED and bidder should make necessary arrangement for integration of the same.

2.2.4.33. Communication Layer Protocol

Should be as per clause 9.3 of IS 16444

2.2.4.34. Key Management and Security Feature

Should be as per IS 15959 Part-1 & Part- 2 with Latest Applicable amendment

2.2.4.35. Usage Application

Indoor and Outdoor usage

2.2.4.36.   Disconnector

The meter shall have the facility of disconnecting and re-connecting the load of the meter from the remote and by authenticated command through Laptop/HHU at site by means of a built-in contactor. This operation shall be conducted with the help of a third party software which is owned by CED and in addition to the manufacturer's own software, both in RF / RF Mesh with fall back provision on Cellular (GPRS/ 3G / 4G / LTE) which can be given through optical port using external modem by utility.

Each operation of the switches shall be logged by the meter as an event with date and time stamp and reading parameters. This operation should be in line with clause 11 of IS 16444 PART-1, however over current tripping should be disabled by default. The cumulative no. of such operations shall also be made available.

The make of the load switch should be of reputed make like Grooner (German) or equivalent and same shall be confirmed by the bidder during tendering. Switch shall be in compliance to IS 15884.

The brief technical particulars of this Disconnector / load switch are furnished below: -

Table 15 - Disconnector Specifications

S.No.	DESCRIPTION	Requirement
1	Operating Voltage range	130 V to 440 V
2	Operating Current range	20 mA to 120 A
3	Maximum switching power	25 kVA per phase/ per IS 15884 Annex G
4	No. of poles	Min. 3 nos (one in each phase R Y B)
5	Operation of switches	Simultaneous
6	Utilization Categories	UC2 or better
7	Min. number of operation	3000 (close, open each)

2.2.5.   Communication capabilities and software feasibilities

(a) The meter shall have facilities for data transfer locally through CMRI (Using optical port/NIC card) and remotely by RF / RF Mesh with proper security via Plug in type NIC.

(b) It should be the responsibility of the bidder to ensure integration of meter into HES (Supplied by RF communication provider) of existing RF-mesh network system of CED. For cellular fallback, the modem / Module should have backward compatibility.

(c) It shall be possible to reconfigure the meters for RTC, TOD Tariff, DIP (Demand Integration period), billing date, display parameters etc. through proper authentication process locally through CMRI and remotely over the air (OTA). Necessary keys if required for performing this reconfiguration operation should also be provided along with supply of meter lot & training to CED staff on how to use it free of cost. Bidder to provide this support on a later stage also on the request of CED without any cost implication.

(d) Optical Communication port shall be available for communication. Communication ports shall not be affected by any type of injection /unauthenticated signals and having proper sealing arrangement. The complete data shall be downloaded within 2 minutes.

(e) The bidder shall supply software required for local (CMRI) & remote (AMI) connectivity including required training to use the software free of cost. Bidder shall provide the communication protocol / APIs for communication with meter through local (CMRI) /

remote (AMI) as and when required by CED free of cost during life time of meter. The bidder should provide DLMS compliance for Communication with the meter at Optical port and at HES.

(f) Bidder should also provide software for changing firmware of meters in mass and should support integration of this software with HES. Bidder should also provide base computer software (BCS) for viewing the data downloaded through HES/CMRI/laptop/HHU in separate PC/laptop. Android based or windows based HHU shall be preferred. API required for converting raw file to XML. (DLMS/OBIS) should also be provided if applicable.

(g) For purpose of exercising control, like outage management, the meter should send abnormalities at the consumers' end like Power failure (Last Gasp), Power Restoration (First Breath). Additional exceptional events should also be communicated to HES by meter immediately after the occurrence through RF / RF Mesh. It should also indicate the restoration of the same event. List of events to be reported should be configurable over the air(OTA). The meter should have "Last Gasp" and "First Breath" feature to facilitate sending alerts to the HES during fully powered off / On condition.

(h) Two way communications between:
   a. Base Station (HES) and Data Concentrator Unit (DCU) shall be through RF / Fiber / Ethernet or any other suitable media, depending upon suitability and choice of CED.
   b. Meter and Intermediated Communication Network Elements (if Exists) and/or Data Concentrator Unit through RF/ Hybrid (combination of RF).
   c. Intermediated Communication Network Elements (if Exists) and Data Concentrator Unit (if different & if applicable) through RF/ Hybrid (combination of RF.

(i) Last mile mesh network must support auto-registration and self-healing feature to continue operation using easiest possible available route in case of failure of any communication device in the mesh.

(j) Meter Serial no will be used for tagging of all data of the meters in all database (at HES / MDM/ DCU level etc.). However, it will be the responsibility of the Bidder to establish the complete communication solution involving all the meters in the system. Also, the Bidder must ensure that, the mode of communication used for RF shall be consistent with the Government of India stipulations.

(k) Integration of meter software's with HES / MDMS for seamless transfer of data will be in scope of bidder till the expiry of warranty of the meters. It is desired firmware up-gradation/selection should be available over the air.

(l) Bidder has to ensure that meter supplied by him will be compatible with RF solution and MDMS supplied by him.

(m) Communication of the meter should be as per IS 15959 (Part-2):2016 or latest amendment.

(n) There should not be any reservation of bidder on a particular frequency band to be used for communication.

(o) Communication network should be immune with any external Magnetic field/ESD/Jammer/HV voltage influence such that it shall not affect the normal overall functionality.

(p) Meter once powered up with NIC card should be self-detected by RF network and its basic name plate details & current readings should be transferred to HES.

2.2.6. Immunity against external influencing signals

a) Magnetic Field:

    a. Meter shall record accurate energy in case of any external influencing signals in line with IS 13779:1999 Cl.11.2 and variation in limits of error (unto 100% Imax) shall be as per the table 17 of IS 13779. Meter shall be immune to magnetic field such that it shall not affect the normal overall functionality However, in case of abnormal magnetic field as defined below meter shall perform as per the following features:

    b. Meter shall log the event in its memory as "Magnet" with date and time stamp threshold values as per Table 16 - Tamper event details for 3 phase meters

Abnormal Magnetic field is defined as below:

    i. Continuous DC magnetic induction: >0.20 Tesla ± 5%(Value of the magneto motive force to be applied shall be generally >17500 ATs, should be immune up to 0.27Tesla)

    ii. AC magnetic induction: Immune for 10 Milli Tesla (if produced with circular metal core with square cross section as specified in CBIP latest report with 2800 AT) / >0.2 Tesla ± 5% (if produced with 14 SWG 25,000 AT air cored magnet as specified in CBIP Technical report no-325).

    iii. Permanent Magnet: Immune up to 0.5T and Event logging >0.5T.

    iv. In all above conditions the Recording to shift on I max and logging in events. The thresh hold values as mentioned in able 16 - Tamper event details for 3 phase meters.

b) Electrostatic Discharge (ESD)

Meter shall be immune up to 8 kV and shall record accurate energy as per IS-13779:1999/CBIP-325. Meter shall log the event into memory as 'ESD' with date & time stamp for any ESD greater than 8 kV with snap shot of Voltage, Phase current, Neutral current, Energy KWh, KVAh and Instant PF. However, in case of ESD application, the meter shall perform as per the following features:

    a. Meter shall log the event in its memory as" ESD" with date and time stamp threshold values as per

    b. Table 16 - Tamper event details for 3 phase meters

    c. The shielding around the meter shall be such that it does not get affected by high Voltage and high energy or low energy impulse when comes in contact with meter from any side. Meter should immune to jammer.

    d. Meter shall latch & store all the tampers events, which have occurred/stored in memory of meter from the date of energization until life of meter. Total tamper storage should be as per Table 16 - Tamper event details for 3 phase meters.

2.2.7. Neutral Disturbance & other tampers

The meter shall not saturate on passage of direct current, which can cause the meter either to stop recording/ record inaccurately. DC injection shall be tested both in phase

and neutral. Measurement by meter shall not get influenced by injection of Chopped signal/ DC signal/ DC pulse up to 330V and for any value beyond this. Meter shall log the event into memory as 'Neutral Disturbance' with date & time stamp the thresholds are as per Table 16 - Tamper event details for 3 phase meters.

2.2.8. Abnormal and Tamper conditions

The meter shall record forward energy under all abnormal tampering conditions and shall be capable of recording occurrence and restoration of abnormal events listed below along with date & time and snap shots of individual voltages, currents, power factors, active energy and apparent energy at the time of occurrence of abnormal event and restoration of normal supply. During abnormal & tamper conditions, the current shall be recorded as active current and line current. Each such event shall be provided with minimum count of as per Table 16 - Tamper event details for 3 phase meters to avoid missing of data amidst usual events (like power failure) due to the limitation of FIFO. Persistence time for occurrence and restoration for the events along with their threshold values shall be as per Table 16 - Tamper event details for 3 phase meters.

Tamper event logging along with values of intensity & snapshot of occurrences & restorations Table 16 - Tamper event details for 3 phase meters.

Note- If the meter senses or records the event above defined threshold then meter shall not be tested in higher values in our lab for particular tamper.

All tamper logging thresholds values shall be configurable from remotes.
Note: "Meter shall have neutral CT for tamper identification and analysis."
The meter shall record in export registers in case of reversal of all CT terminals. The meters are to be used for registration of energy consumed by the consumer, as such the meters shall be programmed for import mode and in case of reversal of energy direction (reversal of all CT terminals) meter shall register energy separately in export mode i.e. in case of CT reversal, meter shall record scalar (not vector sum) sum of energy.

The meter shall register correctly if supply neutral is not available at the meter neutral terminal. The meter shall work in absence of any phase. It shall keep recording correctly in case of unbalance system voltage also as defined above.

The meter shall keep working accurately irrespective of the phase sequence of the supply. The meter shall be functional even if somehow change in the phase sequence takes place. Meter shall sufficiently record this feature as reverse sequence.

Table 16 - Tamper event details for 3 phase meters

Persistence Time for Occurrences	Persistence Time for Restoration	Threshold Value for Occurrence of Events	Threshold Value for Restoration of Events	Compartment Size
ESD/JAMMER = 0 Hr 02 Min 0 sec	ESD/JAMMER = 0 Hr 02 Min 0 sec (ESD)	Immunity up to 8 KV with NIC and logging of value from 1 KV to 50 KV	Removal of ESD signal	25

(ESD)				
Magnet = 0 Hr 10 Min 0 sec (MAG)	Magnet =0 Hr 10 Min 0 sec (MAG)	> 50 mT (permanent magnet) OR DC magnetic induction > 200 mT OR AC magnetic induction > 50 mT	< 50 mT (permanent magnet) OR DC magnetic induction < 50 mT or AC magnetic induction <50 mT	25
Meter Top Cover Open (TC Open)	Meter Top Cover Open (TC Open)	If meter top cover is opened	NA	05 (Stay put Type)
Potential Missing =0 Hr 10 Min 0 sec (PM)	Potential Missing =0 Hr 10 Min 0 sec	Voltage < 70% of Vref AND current > 2% Ibasic	Voltage > 80% of Vref AND current > 2% Ibasic	25
Voltage Unbalance =0 Hr 10 Min 0 sec (VU)	Voltage Unbalance = 0 Hr 10 Min 0 sec	20% or more between the phases and current > 2% Ibasic	Shall be less than 10 % between the phases and current > 2% Ibasic	25
CT Open (phase wise) = 0 Hr 10 Min 0 sec	CT Open (phase wise) = 0 Hr 10 Min 0 sec	Ir + Iy + Ib + In ≥ 10 % of Ibasic (vector Sum) AND Phase current < 1% of Ibasic with All current positive	Ir + Iy + Ib + In < 5 % of Ibasic. (vector Sum) AND Phase current > 10% of Ibasic with All current positive	25
CT Reversal =0 Hr 10 Min 0 sec (CTR)-----(*NOT Applicable for Net meter Configuration)*	CT Reversal =0 Hr 10 Min 0 sec	Active current negative	Active current positive AND > 2 % Ibasic	25
CT Bypass = 0 Hr 10 Min 0 sec (CTB)	CT Bypass = 0 Hr 10 Min 0 sec	Ir + Iy + Ib + In ≥ 10 % of Ibasic (vector Sum) AND Phase current > 10% of Ibasic with All current positive	Ir + Iy + Ib + In < 5 % of Ibasic. (vector Sum) AND Phase current > 10% of Ibasic with All	25

			current positive	
Current Unbalance =0 Hr 10 Min 0 sec (CU)	Current Unbalance = 0 Hr 10 Min 0 sec	Current difference > 30% between the phases AND Ir + Iy + Ib + In ≥ 10 % of Ibasic (vector Sum)	Current difference < 20% between the phases AND Ir + Iy + Ib + In < 5 % of Ibasic (vector Sum)	25
Low Power Factor = 0 Hr 10 Min 0 sec (LPF)	Low Power Factor =0 Hr 10 Min 0 sec	Power Factor ≤ 0.5	Power Factor > 0.7	25
Neutral Disturbance =0 Hr 10 Min 0 sec (ND)	Neutral Disturbance =0 Hr 10 Min 0 sec (ND)	Voltage >145% of Vref Current >10% Ib OR Frequency < 47 Hz OR Frequency > 52 Hz OR DC voltage / signal injection	Voltage <115% of Vref Current > 10% Ib AND Frequency > 47 Hz OR Frequency < 52 Hz	25
Power On Off = 0 Hr 10 Min 0 sec	Power On Off = 0 Hr 10 Min 0 sec	Actual Voltage off	Actual Voltage On	25
High Voltage = 0 Hr 10 Min 0 sec (HV)	High Voltage =0 Hr 10 Min 0 sec	Voltage > 130% of Vref	Voltage <110% of Vref	25
High Neutral Current =0 Hr 10 Min 0 sec (HNC)	High Neutral Current =0 Hr 10 Min 0 sec	Ir + Iy + Ib + In > 20% of Ibasic AND In > 10% of Ibasic	Ir + Iy + Ib + In < 10% of Ibasic AND In < 5% of Ibasic	25
Temperature Rise = 0 Hr 30 Min 0 sec (TR)	Temperature Rise = 0 Hr 30 Min 0 sec (TR)	Temperature > 100 Degree C	Temperature < 80 Degree C	25 (Stay put type)
Over Load (If enabled) OL	Over Load = 0 Hr 30 Min 0 sec (TR)	>preset value (default value shall be 120%)	<preset value/default value	25

2.2.9. GENERAL CONSTRUCTION REQUIREMENT

The Meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially personal safety against electric

shock, safety against effect of excessive temperature, protection against spread of fire, protection against penetration of solid objects, dust and water.

All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions.

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components.

All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy as given below or any other equivalent make with the strict approval of Purchaser:

The bidder is also required to furnish details as per the table mentioned below.

Table 17

S No	Component Function	Requirement	Makes and Origin(to Be provided by bidder)
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	
3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	
6.	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.	
7.	Battery	Lithium with guaranteed life of 15 years	
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	

2.2.10. Meter Body
   a) Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II) with FV0 Fire Retardant, self -extinguishing, UV stabilize, recyclable and Anti oxidation properties.

b) The minimum thickness of the meter enclosure shall be 2mm.

c) Meter base shall be opaque with polycarbonate LEXAN 500R or equivalent on prior approval from the CED.

d) Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the CED.

e) Meter cover & base shall be provided with Ultrasonic/Chemical welding/Push fit mechanism or combination in such a way that it is not possible to open the meter box without breaking (break-to-open design) the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence.

f) The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s).

g) Unidirectional screws to be used on meter covers where ever required.

2.2.11. Terminals, Terminal Block

a) Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block adequate testing of materials shall be taken into account.

b) Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the test given in ISO 75 for temperature of 180°C and pressure of 1.8 MPa.

c) The terminal block shall be of opaque with polycarbonate LEXAN500R or equivalent on prior approval from the CED.

d) To get the desired temp rise & avoid hot spots the design of each terminal screw, preferred terminal screw shall be with hex head screw / allen head screw & shall be operated with allen key or special key. The preferred Size of the allen screw shall be 6mm dia.

e) The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

f) The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Terminals shall be preferably with Allen screw with at least 8 mm dia for better contact area. Terminal & screw should not be damaged during regular opening and tightening.

g) Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

2.2.12. Terminal Cover

Terminal cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the CED. Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be as per the CED approval). After sealing the cover, terminals shall not be accessible without breaking the seals.

2.2.13. Sealing of meter

Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. For this, one no. Polycarbonate seal and one no. Hologram seal shall be provided by the Purchaser. One no polycarbonate seal and one no. hologram seal shall be provided by the bidder. All the seals shall be fixed on meter body by the bidder at his works before dispatch.

One sealing provision shall be provided at meter terminal cover; such that terminal shall not be accessible without breaking the seals. All the seals shall be provided on front side only and as per the Purchaser specification. Rear side sealing arrangement shall not be accepted. Bidder shall provide seals be as per CEA regulation (2006). Only patented seals to be used as per CEA requirements.

Plug in type NIC card should have proper sealing arrangement.

2.2.14. TOD FEATURE

The meter shall be capable of measuring Cumulative Energy (KWh), and MD (KW) with time of day (TOD) registers having 8 zones & 02 seasons (no. of zones & time slot shall be programmable by CMRI with adequate security level and in one to one /broadcast mode over the air).

2.2.15. MD INTEGRATION

The MD integration period shall be 30 minutes (integration period-programmable by CMRI at site and also through AMR with adequate security level). The MD resetting shall be automatic at the 1st of the month i.e. 0000 hours of 1st day of the month. Manual MD reset button shall not be available. Last six MD values shall be stored in the memory and one to be displayed in the Auto scroll mode. MD shall be recorded and displayed with minimum three digits before decimal and minimum two digits after decimal points.

2.2.16. PARAMETERS IN BCS

The parameters in BCS shall be as under

2.2.16.1. Load Survey

The meter shall be capable of recording 30 minutes average of the following parameters for at least last 45 days

a) Voltage for each phase
b) Current of each phase
c) Average PF
d) Average KWh
e) Average KVAh
f) KVArh(Lagging)
g) KVArh(Leading)
h) Temperature(Deg-C)

Meter shall be capable of recording daily Energy and Demand 00:00 to 24:00 Hrs KWh/KVAh, KW/KVA in BCS for 45 days. Midnight energy value of KWh/KVAh and KW/KVA should be available in meter memory for last 45 days.

2.2.16.2. Instantaneous Parameters

Meter shall be capable for following Instantaneous Parameters in Memory and should be available in BCS.

Table 18

Meter Sr.No.	
Meter Type	
Meter date & Time	DDMMYYYY HHMM SS
MRI/PC date & Time	DDMMYYYY HHMM SS
Dump date & Time	DDMMYYYY HHMM SS
Voltage –R	000.000V
Voltage –Y	000.000V
Voltage –B	000.000V
Line Current -R	00.000A
Line Current -Y	00.000A
Line Current -B	00.000A
Neutral Current	00.00A
Active Current -R	00.000A
Active Current -Y	00.000A
Active Current -B	00.000A
Reactive Current-R	00.000A
Reactive Current-Y	00.000A
Reactive Current-B	00.000A
Power factor-R	0.000
Power factor-Y	0.000
Power factor-B	0.000
Average Power factor	0.000
Instantaneous Frequency	00.000Hz
Instantaneous Load	Active ,Reactive Lag/Lead, Apparent
Present Cumulative Energy	Active ,Reactive Lag/Lead, Apparent
Cumulative Power Off Duration	00000
Cumulative Power ON Duration	00000
Cumulative Tamper count	00000
Cumulative Tamper duration	00000
Cumulative Billing Count	00000
Last Billing date	dd:mm:yy
No of Power failure	00000
Temperature(Deg C)	
Vector/phasor diagram (also showing neutral current)	
No. of Disconnector operation	00000

2.2.16.3. General Information

Meter shall be capable for providing below mentioned general parameters in memory

- Meter Serial number
- Software Name

- Version
- Manufacture Name
- Manufacture Year
- Meter Type
- Meter Class
- Meter Constant
- Meter Voltage Rating
- Meter Current Rating
- TOD profile

2.2.16.4. Billing Parameters

(a) Maximum Demand (Reset date & all History, time zone register wise)

    i. MD - Abs Active Load/ kW

    ii. MD - Abs Apparent/ kvA

    iii. MD Abs Active Load KW Export (*For Net configuration*)

    iv. MD - Abs Apparent/ kvA Export (*For Net configuration*)

In addition, Reactive MDIs under different combinations will be required.

(b) Billing Dates (06 History)

(c) Flags Description

    i. NVM

    ii. RTC

    iii. Battery

(d) Counters

Description	Date & Time	Value

    Billing count

(e) Main Energy (Reading date & all History, time zone register wise; Minimum 6 Histories)

    i. Period

    ii. Total active

    iii. Total reactive Lag Import

    iv. Total Reactive Lead Import

    v. Total Apparent Import

    vi. Total active Export *(For Net Configuration)*

    vii. Total reactive Lag Export *(For Net Configuration)*

    viii. Total Reactive Lead Export *(For Net Configuration)*

    ix. Total Apparent Export *(For Net Configuration)*

    x. Net Active *(For Net configuration)*

(f) Consumption (Reading date & all History, time zone register wise; Minimum 6 Histories)

    i. Period

    ii. Total active

    iii. Reactive Lag Import

      iv. Reactive Lead Import

      v. Apparent Import

      vi. Active Export *(For Net Configuration)*

      vii. Reactive Lag Export *(For Net Configuration)*

      viii. Reactive Lead Export *(For Net Configuration)*

      ix. Apparent Export *(For Net Configuration)*

      x. Net Active *(For Net configuration)*

      xi. Power factor

      xii. CMD

  (g) Mode of operation of dis-connector switch

Last ten modes with date & time of switching with energy parameters (kwh, KVAh, TOD1 Kwh, TOD2 Kwh, TOD3 Kwh, TOD1 KVAh, TOD2 KVAh, TOD3 KVAh)

2.2.17. Transactions

All the changes in software of meter to be logged along with date & time stamp and readings. Meter should do billing if any transaction is done.

2.2.18. Tamper Events

All the events should be logged as per

Table 16 - Tamper event details for 3 phase meters

2.2.19. Display Units

The display unit shall be Pin type built-in liquid crystal display (Permanently backlit type LCD). The LCD shall be of STN (Super Twisted Nematic) construction suitable for maximum temperature withstands 65^0 C and minimum temperature withstands 0^0 C during normal operating condition. The LCD display shall have a wide viewing angle of 120 degrees. When the meter is not energized the electronic display need not be visible. The display shall not be affected by electrical, magnetic disturbances and ESD. The display should be readable in direct sunlight.

The KWh & KVAh register shall have minimum 7 main digits LCD display and size of the digits shall be minimum 10mmx5mm. Cumulative energy (KWh & KVAh) shall be displayed without decimal in auto scroll mode. (However decimal shall be available in push button mode for high resolution display for testing).

2.2.20. Auto Scroll mode*(For Import Configuration)*

Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (i.e. if MD1 is displayed in Auto scroll mode, Header (MD1) and value (say 5.23 KW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 10 secs, if push button is not operated.

Display should not be stuck for any tamper events.

Following shall be continuously displayed in auto scroll and push button mode in the given order.

Table 19

Sr. No.	Auto Scroll Display
1	LCD CHECK
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.

3	d- dd:mm:yy
4	t- hh:mm:ss
5	b 1 KWh KWh reading on 1st of last month at 00.00 hrs.
6	b 1KVAh KVAh reading on 1st of last month at 00.00 hrs.
7	b 11MD KW MD in KW on 1st of last month at 00.00 hrs.
8	b 12MD KVAMD in KVA on 1st of last month at 00.00 hrs.
9	b 1 PF Average power factor of entire month on 1st of last month at00.00 hrs.
10	C KWh Current Cumulative KWh
11	C KVAh Current Cumulative KVAh
12	C KVARh lag Current Cumulative KVARh(lag).
13	C KVARh lead Current Cumulative KVARh(lead).
14	Pr 1 MD KW Current MD – KW
15	Pr 1 MD KVA Current MD – KVA
16	rc MDMD reset count
17	U1VR Phase Voltage (Instantaneous value).
18	U2V Y Phase Voltage (Instantaneous value).
19	U3V B Phase Voltage (Instantaneous value).
20	A1AR Phase Current (Instantaneous value).
21	A2AY Phase Current (Instantaneous value).
22	A3AB Phase Current (Instantaneous value).
23	Pr PF Instantaneous power factor
24	Pr KW Instantaneous load in KW
25	Pr KVA Instantaneous load in KVA
26	Status of load switch(Connect or disconnect)

Fail to be log in memory in the following conditions only in BCS not in display
   a. RTC fail
   b. NVM memory fail
   c. Battery fail
   d. NIC card fail

2.2.21. Push Button Scroll mode*(For Import Configuration)*
Following parameters shall be displayed in Push button mode in the given order after display of all the tamper events.

Table 20

Sr. No.	Push Button Display
1	LCD CHECK
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.
3	d- dd:mm:yy
4	t- hh:mm:ss
5	b 1 KWh KWh reading on 1st of last month at 00.00 hrs.
6	b 1KVAh KVAh reading on 1st of last month at 00.00 hrs.
7	b 11MD KW MD in KW on 1st of last month at 00.00 hrs.

8	b 12MD KVAMD in KVA on 1st of last month at 00.00 hrs.
9	b 1 PF Average power factor of entire month on 1st of last month at00.00 hrs.
10	C KWh Current Cumulative KWh
11	C KVAh Current Cumulative KVAh
12	C KVARh lag Current Cumulative KVARh(lag).
13	C KVARh lead Current Cumulative KVARh(lead).
14	Pr 1 MD KW Current MD – KW
15	Pr 1 MD KVA Current MD - KVA
16	rc MDMD reset count
17	U1VR Phase Voltage (Instantaneous value).
18	U2V Y Phase Voltage (Instantaneous value).
19	U3VB Phase Voltage (Instantaneous value).
20	A1AR Phase Current (Instantaneous value).
21	A2AY Phase Current (Instantaneous value).
22	A3AB Phase Current (Instantaneous value).
23	Pr PF Instantaneous power factor
24	Pr KW Instantaneous load in KW
25	Pr KVA Instantaneous load in KVA
26	Status of load switch(connect or disconnect)
27	Count of connect and disconnect
28	Reading in high resolution(up to 3 digits after decimal)

Table 21

Sr. No.	Auto Scroll Display (Net Meter Configuration)
1	LCD CHECK
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.
3	d- dd:mm:yy
4	t- hh:mm:ss
5	b 1 KWh Import KWh reading on 1st of last month at 00.00 hrs.
6	b 1 KVAh Import KVAh reading on 1st of last month at 00.00 hrs.
7	b 1 KVArh Lag ImportKVAh reading on 1st of last month at 00.00 hrs.
8	b 1 KVArh Lead Import KVAh reading on 1st of last month at 00.00 hrs.
9	b 1MD KW import MD in KW on 1st of last month at 00.00 hrs.
10	b 1MD KVA import MD in KVA on 1st of last month at 00.00 hrs.
11	b 1 KVArh Lag Import KVAh reading on 1st of last month at 00.00 hrs.
12	b 1 KVArh Lead Import KVAh reading on 1st of last month at 00.00 hrs.
13	b 1 KWh Export KWh reading on 1st of last month at 00.00 hrs.
14	b 1KVAh Export KVAh reading on 1st of last month at 00.00 hrs.
15	b 1 KVArh Lag Export KVAh reading on 1st of last month at 00.00 hrs.
16	b 1 KVArh Lead Export KVAh reading on 1st of last month at 00.00 hrs.
17	b 1MD KW Export MD in KW on 1st of last month at 00.00 hrs.
18	b 1MD KVA Export MD in KVA on 1st of last month at 00.00 hrs.

19	b 1 KVArh Lag Export KVAh reading on 1st of last month at 00.00 hrs.
20	b 1 KVArh Lead Export KVAh reading on 1st of last month at 00.00 hrs.
21	b 1 PF Average power factor of entire month on 1st of last month at00.00 hrs.
22	C KWh import Current Cumulative KWh
23	C KVAh Import Current Cumulative KVAh
24	C KVARh lag Import Current Cumulative KVARh(lag).
25	C KVARh lead Import Current Cumulative KVARh(lead).
26	C KWh Export Current Cumulative KWh
27	C KVAh Export Current Cumulative KVAh
28	C KVARh lag Export Current Cumulative KVARh(lag).
29	C KVARh lead Export Current Cumulative KVARh(lead).
30	Pr 1 MD KW Current MD – KW
31	Pr 1 MD KVA Current MD - KVA
32	rc MDMD reset count
33	U1VR Phase Voltage (Instantaneous value).
34	U2V Y Phase Voltage (Instantaneous value).
35	U3V B Phase Voltage (Instantaneous value).
36	A1AR Phase Current (Instantaneous value).
37	A2AY Phase Current (Instantaneous value).
38	A3AB Phase Current (Instantaneous value).
39	PrPF Instantaneous power factor
40	PrKWInstantaneous load in KW
41	PrKVA Instantaneous load in KVA
42	Status of load switch(Connect or disconnect)

2.2.22. Push Button Scroll mode (ForNet Configuration)

Following parameters shall be displayed in Push button mode in the given order after display of all the tamper events.

Table 22

Sr. No.	Push Button Display (For Net Configuration)
1	LCD CHECK
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.
3	d- dd:mm:yy
4	t- hh:mm:ss
5	b 1 KWh Import KWh reading on 1st of last month at 00.00 hrs.
6	b 1KVAhImport KVAh reading on 1st of last month at 00.00 hrs.
7	b 1 KVArh Lag Import KVAh reading on 1st of last month at 00.00 hrs.
8	b 1 KVArh Lead Import KVAh reading on 1st of last month at 00.00 hrs.
9	b 1MD KW import MD in KW on 1st of last month at 00.00 hrs.
10	b 1MD KVA import MD in KVA on 1st of last month at 00.00 hrs.
11	b 1 KVArh Lag Import KVAh reading on 1st of last month at 00.00 hrs.
12	b 1 KVArh Lead Import KVAh reading on 1st of last month at 00.00 hrs.
13	b 1 KWh Export KWh reading on 1st of last month at 00.00 hrs.

14	b 1KVAh Export KVAh reading on 1st of last month at 00.00 hrs.
15	b 1 KVArh Lag Export KVAh reading on 1st of last month at 00.00 hrs.
16	b 1 KVArh Lead Export KVAh reading on 1st of last month at 00.00 hrs.
17	b 1MD KW Export MD in KW on 1st of last month at 00.00 hrs.
18	b 1MD KVA Export MD in KVA on 1st of last month at 00.00 hrs.
19	b 1 KVArh Lag Export KVAh reading on 1st of last month at 00.00 hrs.
20	b 1 KVArh Lead Export KVAh reading on 1st of last month at 00.00 hrs.
21	b 1 PF Average power factor of entire month on 1st of last month at00.00 hrs.
22	C KWh import Current Cumulative KWh
23	C KVAh Import Current Cumulative KVAh
24	C KVARh lag Import Current Cumulative KVARh(lag).
25	C KVARh lead import Current Cumulative KVARh(lead).
26	C KWh Export Current Cumulative KWh
27	C KVAh Export Current Cumulative KVAh
28	C KVARh lag Export Current Cumulative KVARh(lag).
29	C KVARh lead Export Current Cumulative KVARh(lead).
30	Pr 1 MD KW Current MD – KW
31	Pr 1 MD KVA Current MD - KVA
32	rc MDMD reset count
33	U1VR Phase Voltage (Instantaneous value).
34	U2V Y Phase Voltage (Instantaneous value).
35	U3V B Phase Voltage (Instantaneous value).
36	A1AR Phase Current (Instantaneous value).
37	A2AY Phase Current (Instantaneous value).
38	A3AB Phase Current (Instantaneous value).
39	Pr PF Instantaneous power factor
40	Pr KW Instantaneous load in KW
41	Pr KVA Instantaneous load in KVA
42	Status of load switch(Connect or disconnect)
43	High Resolution C KWh import

Note: These Display parameters should have provision for inserting 24 additional parameters in display for future requirement.

2.2.23. Output Device

(a) Pulse Rate: The meters shall have a suitable test output device. Red color blinking LED (marked as imp/kWh) shall be provided in the front. This device shall be suitable for using with sensing probe used with test benches or reference standard meters. The test output device shall have constant pulse rate of (preferred value- 3200) pulse / kWh. Meter constant shall be indelibly printed on the name plate as (preferred value- 3200) imp / KWh.

(b) Communication LCD indicator- The meter shall be provided with suitable LCD indication for communication in progress.

(c) Load Switch LCD indicator- The meter shall be provided with suitable LCD indication for condition of load switch (Close/open). LCD should show when load switch is open.

2.2.24. Mid Night Values

Meter should have mid night log for KWh for last 45 days.

2.2.25. NAME PLATE AND MARKING

Meters shall have a name plate clearly visible and effectively secured against removal. The base color of Name plate shall be approved by CED, indelibly and distinctly marked with all essential particulars as per relevant standards along with the following.

1. Manufacturer's name
2. Type designation
3. Number of phases and wires
4. Serial number (Meter serial number shall be laser printed on name plate instead on sticker).
5. Month and Year of manufacture
6. Unit of measurement
7. Reference voltage, frequency
8. Ref. temperature if different from 27 deg. C
9. Rated basic and maximum Current
10. Meter constant (imp/kWh)
11. 'BIS' Mark
12. Class index of meter
13. "Property of CED
14. Purchase Order No. & date
15. Guarantee period
16. Rated frequency
17. Sign of double square
18. Country of manufacture
19. Symbol of load switch
20. Communication Tech for WAN and NAN (with carrier frequency)
21. Communication Technology is IHD supported (with carrier frequency)
22. Firmware version for meter
23. Category

However, the following shall be printed in bar code on the meter nameplate. (Shall be printed on name plate instead on sticker).

1. Manufacturer's code No. (given by CED)
2. Meter Sr. No.
3. CED Property
4. Month/Year of manufacture.

2.2.26. TESTS

All routine, acceptance & type tests shall be carried out on the meter and meter body separately in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the

purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted in addition to the tests specified in IS/IEC.

2.2.26.1.   Type Test

    (e) All tests as defined in IS 16444 Part-1: 2015 /IS 13779:1999 / IS15959 Part-2: 2016.

    (f) Test against abnormal magnetic influence as per CBIP TR 325.

    (g) DC immunity test (injection both on phase and neutral terminal) Test for Material used for Terminal Block and meter body as per relevant standards.

    (h) IP test

2.2.26.2.   ROUTINE TEST

    a) AC High Voltage test

    b) Insulation test

    c) Test on limits of error

    d) Test of starting current

    e) Test of no load condition

2.2.26.3.   ACCEPTANCE TEST

    a) AC High Voltage test

    b) Insulation test

    c) Test on limits of error with following loads:

Table 23

120% I max(120A)	I max (100A)	Ib(20A)	0.5 Ib (10A)	0.1Ib (2A)	0.05Ib (1A)
UPF, 0.8 lead and 0.5 lag	UPF, 0.8 lead and 0.5 lag	UPF, 0.8 lead and 0.5 lag	UPF, 0.8 lead and 0.5 lag	UPF, 0.8 Lead and 0.5 lag	UPF

    d) Test of meter constant

    e) Test of starting current

    f) Test of no load condition

    g) Test of repeatability of error.

    h) Test of power consumption.

    i) Test for Immunity against external influencing signal as per the Purchaser specification

    j) Test for Immunity against DC Immunity as per the Purchaser specification

    k) Test for Immunity against Tamper conditions as per the Purchaser specification

    l) Error measurements with 38 (as Applicable) abnormal condition as per Annexure -1

    m) Test to Influence of Harmonics

    n) Supply voltage and frequency variation test

    o) Testing of self-diagnostic features and tamper count increment and logging with date and time.

    p) All tests as defined in IS 15959(Part-2): 2016 or in Latest Applicable amendment.

2.2.26.4.   Deleted

2.2.27. TYPE TEST CERTIFICATE

The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI as per the relevant standards. For communication testing any national approved laboratory or international acclaimed lab or equivalent will also suffice at the discretion of CED. Type test should have been conducted in certified Test Laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to CED.

2.2.28. PRE-DISPATCH INSPECTION

The successful bidder shall facilitate the pre-dispatch inspection at their works site. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. The decision of the purchaser shall be final in this regard.

Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Bidder shall grant free access to the places of manufacture to CED's representatives at all times when the work is in progress. Inspection by the CED or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by CED.

Following documents shall be sent along with material:

a. Govt certified/accredited lab testing certificate
b. Meter Test reports
c. MDCC issued by CED
d. Invoice in duplicate
e. Packing list
f. Drawings & catalogue
g. Guarantee / Warranty card
h. Delivery Challan
i. Other Documents (as applicable)
j. One no. leaflet with each meter

2.2.29. INSPECTION AFTER RECEIPT AT STORE

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to RECPDCL and CED each.

2.2.30. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the

purchaser up to a period of at least 60 months from the date of Project Go-Live, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the purchaser, failing which the purchaser will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the purchaser's own charges (@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

2.2.31. PACKING

(a) Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The material used for packing shall be environmentally friendly. Packing and transportation shall be as per IS 15707:206 clauses 9.1 and 9.2.

(b) Individual meter should be packed in separate box. Routine test report of the individual meter shall be kept inside each card board carton of the meter.

(c) On back side of RTC the bidder shall print a picture of the meter with its small details like for consumer to know about meter.

2.2.32. QUALITY CONTROL

The bidder shall submit with the offer 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.

Quality should be ensured at the following stages:

(e) At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.

(f) At insertion stage, all components should undergo computerized testing for conforming to design parameter and orientation.

(g) Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipment (ATEs).

(h) Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will be kept in ovens for 24 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 24 hours' meter should work satisfactorily)

The CED's engineer or its nominated representative shall have free access to the bidder's/manufacturer's works to carry out inspections.

2.2.33. MINIMUM TESTING FACILITIES

Bidder should ensure that supplier of meter should have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards/CED specification. The bidder shall have duly calibrated Reference Standard meter of Class 0.1 or better accuracy or better.

2.2.34. MANUFACTURING ACTIVITIES

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart shall be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

2.2.35. SPARES, ACCESSORIES AND TOOLS

Bidder to be provide free of cost 04 nos of jig for retrieving data from memory of meter with every new design of meter in which previous jig is supplied cannot be used. Jig should be such that NVM can be push fit on this jig and data can be retrieve from this NVM.

40 nos of optical cord for retrieving the data of meter through optical port should be provided, if design of optical port is changed from those of previously supplied meters.

2.2.36. DRAWINGS AND DOCUMENTS

Following drawings & Documents shall be prepared based on CED specifications and statutory requirements and shall be submitted after award of work for approval:

(a) Completely filled-in Technical Parameters.
(b) General arrangement drawing of the meter
(c) Terminal Block dimensional drawing
(d) Mounting arrangement drawings
(e) General description of the equipment and all components with makes and technical requirement.
(f) Type Test Certificates
(g) Experience List
(h) Manufacturing schedule and test schedule

After the award of the contract, four (4) copies of following drawings, drawn to scale, describing the equipment in detail shall be forwarded for approval:

Table 24

S. No.	Description	For Approval	For Review Information	Final Submission
1	Technical Parameters	√		√
2	General Arrangement drawings	√		√
3	Terminal block Dimensional drawings	√		√
4	Mounting arrangement drawing	√		√
5	Manual/Catalogues		√	
6	Transport/ Shipping dimension drawing		√	√
7	QA &QC Plan	√	√	√
8	Routine, Acceptance and Type Test Certificates	√	√	√

Bidder shall subsequently provide Four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to CED.

All the documents & drawings shall be in English language.

Instruction Manuals: Bidder shall furnish two softcopies (CD) and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

2.2.37. GUARANTEED TECHNICAL PARTICULARS

Successful Bidder must ensure to furnish following GTP after award of contract for approval.

Table 25 - GUARANTEED TECHNICAL PARTICULARS (GTP)

S.No	Description	Units	As Furnished by Bidder
1	Type of meter		
2	Accuracy Class of the meter		
3	Ib & Imax	A	
4	c. Operating Voltage for meter d. Operating Voltage with communication unit functionality	V	
5	Operating Frequency	Hz	
6	Power Consumption and Burden		
7	Starting Current	mA	
8	Short time over current	A	
9	Influence of heating		
10	Rated impulse withstand voltage	KV	
11	AC withstand Voltage for 1 min	KV	
12	Insulation resistance c) Between frame &Current, voltage circuits connected together: d) Between each current (or voltage circuit) & each and every other circuit.	M ohm	
13	Mechanical requirement as per IS 13779		
14	Resistance to heat and fire (As per specification)		
15	Degree of protection		
16	Resistance against climatic influence (as per IS 13779)		
17	Electromagnetic Compatibility (EMC)		
18	Accuracy requirements (As per IS 13779		
19	Power factor range		

20	Energy measurement		
21	Connection Diagram for system on terminal cover	Yes/No	
22	Self-diagnostic feature		
23	Initial startup of meter (meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals)		
24	Terminal block		
	a)Depth of the Terminal holes	mm	
	b)Internal diameter of terminal holes	mm	
	c) Clearance between adjacent terminals	mm	
25	Communication capabilities as per clause2.2.4.32		
26	Immunity against abnormal Magnetic influence, as defined in Clause2.2.6		
27	Immunity against ESD as defined in Clause2.2.6		
28	DC Immunity as defined in Clause2.2.4.18		
29	Abnormal and tamper Conditions as per Table 16 - Tamper event details for 3 phase meters	Yes/No	
30	Grade of material for e) Meter base f) Meter cover g) Terminal block h) Terminal cover		
31	Tamper counts		
32	Recording forward energy in all conditions	Yes/No	
33	Makes of all components used in the meter as per clause 2.2.9 to be provided	Yes/No	
34	Non Volatile memory (Retention period)		
35	Measuring elements used in the meter		
36	Power supply to circuit in case of supply failure		
37	Display of measured values (As per specification – clause 2.2.4.28	Yes/No	
38	LCD display (Type and viewing angle)		
39	Pulse rate	Imp/kWh, Imp/KVARh	
40	Name plate marking	Yes/No	
41	Routine test certificates	Yes/No	
42	Acceptance test certificates	Yes/No	
43	Type test certificates	Yes/No	
44	Guarantee certificates	Yes/No	
45	Output Device (LEDs) As per Clause 2.2.23	Yes/No	
46	Make of Disconnector switch		

47	Disconnector Technical particular as per Specification Clause2.2.4.36	Yes/No	
48	Terminal Screw dia.		
49	Allen Screw head size (Terminal Screw)		

50	Fire retardant category of the material
	      (b) Meter body
	      (c) Terminal block		

2.2.38. SCHEDULE OF DEVIATIONS

Bidders should submit the No-Deviation form as per the Form IV format.

2.3. THREE PHASE CT OPERATED SMART METER for DT

2.3.1. SCOPE

The specification covers design, engineering, manufacturing, assembly, inspection, testing & integration with network integration card (NIC) of RF communication at manufacturers' works before dispatch, forwarding, unloading at store/site and supply of 3 phase 4 wire, 3 X 230 volts, ---/5 Amp CT operated static smart meter of Class 0.5s accuracy complete with all accessories for efficient and trouble free operation for indoor & outdoor use.

It is not the intent to specify completely herein all the details of tech design and construction of material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in 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 Bidder's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.3.2. APPLICABLE STANDARDS

The equipment covered by this specification shall conform to the requirements stated in latest editions of relevant Indian/ IEC Standards and shall conform to the regulations of local statutory authorities.

Table 26

a	IS 14697(1999)	A.C. static transformer operated watt hour and Var-hour meters, class 0.2s,0.5s
b	IS 16444-Part2(2017)	A.C. static transformer operated watt hour and Var-hour smart meters, class 0.2s,0.5s, 1.0s
c	IS 9000	Basic Environmental testing procedure for electrical and electronic items
d	IS 12346 (1999)	Specification for testing equipment for A.C. Electrical energy meter
e	IS11000 (1984)	Fire hazard testing
f	IEC 62053-11 *(2003)*	Electricity metering equipment (a.c.)-Particulars requirements-part 11:Electromechanical meter for active energy(classed 0.5,1.0 and 2)
g	IEC 62053-22 (2003)	Electricity metering equipment (a.c.)-Particulars
h	IS 15707 (2006)	Testing Evaluation installation and maintenance of AC Electricity.
i	IEC 60068	Environmental testing

j	CBIP-TR No.325	Specification for A.C.Static Electrical Energy Meters (latest amendment).
k	CEA Regulation (2006)	Installation and operation of meters Dtd: 17/03/2006
l	IS 15959(Part 1-2011)	Data exchange for electricity meter reading, tariff and load control
m	IS 15959(Part 2-2016)	Data exchange for electricity meter reading , tariff and load control
n	IS 15959(Part 3-2017)	Data exchange for electricity meter reading , tariff and load control

2.3.3. CLIMATIC CONDITIONS OF THE INSTALLATION

Table 27

Max. Ambient Temperature	50^0C
Max. Daily average ambient temp.	40^0C
Min Ambient Temp	0^0C
Maximum Humidity	95-100%
Minimum Humidity	10%
Average No. of thunderstorm days per annum	50
Maximum Annual Rainfall	750mm
Average No. of rainy days per annum	60
Rainy months	June to October
Altitude above MSL not exceeding	300 Meters
Wind Pressure	126 kg/sq. m up to an elevation at 10 m
The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.3 g.	

2.3.4. GENERAL TECHNICAL REQUIREMNTS

Table 28

S.No.	DESCRIPTION	REQUIREMENT
4.1	Type of the meter	Three phase four wire, CT operated static smart meter. It consisting of measuring elements(s),time of use of register(s),display, and plug in typebi-directional communication module all integral with the meter housing.
4.2	Accuracy Class of the meter	0.5s
4.3	Basic Current (I_b) & Rated Maximum current (I_{max})	I_b= 5A; I_{max}=10Amps
4.4	Reference Conditions for Testing the performance of	V_{ref} = 240 V ± 1 % as per IS 14697 Frequency =50hz ± 0.3%

	the meter	Temperature= 27 C$\pm$ 2 ^{0}C
(if the tests are made at the temperature other than reference temperature the results shall be corrected by applying Mean Temperature Coefficient 0.05)
4.5	Operating Voltage	Meter shall be operational with required accuracy from 0.6 Vref to1.2 Vref.
4.6	Operating Frequency	50 Hz$\pm$ 5%.
4.7	Power Consumption	Voltage circuit: Maximum 5.0 W and 15 VA Current Circuit: Maximum 4 VA (The additional power requirement during data transmission shall not exceed 7W/as mentioned in IS 16444 whichever is lower, per communication module).
4.8	Starting Current	5 mA(0.1% of I_b)
4.9	Short time over current(Secondary)	200 Amp for 0.5sec ($20I_{max}$ for 0.5 Sec)
4.10	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature at 45^0C.
4.11	Rated Impulse withstand voltage	6KV (Shall be applied ten times with one polarity & then repeated with the other polarity and minimum time between each impulse to be 3 sec.
4.12	AC withstand voltage for 1 min	4 KV
4.13	Minimum Insulation resistance
a) Between frame & current, voltage circuits connected together:
b) Between each current (or voltage circuit) & each and every other circuit.: | 5 M ohm

50 M ohm. |
| 4.14 | Mechanical requirements | Meter shall be in compliance with clause 12.3 of IS 14697 |
| 4.15 | Resistance to heat and fire | The terminal block, terminal cover and Meter case shall ensure safety against spread of fire. They should not be ignited by thermal overload of live parts in contact with them as per clause 6.8 of IS 14697. |
| 4.16 | Protection against penetration of dust and water. | Degree of protection: IP 51 as per IS 12063, but without suction
in the meter. |
| 4.17 | Resistance against Climatic influence. | Meter shall be in compliance with clause 12.6 of IS 14697. |

4.19	Accuracy requirements	Meter shall be in compliance with clause 11 of IS 14697.
4.20	Power factor range	Zero lag to Zero lead.(meter shall be programmed for 'Lag only configuration i.e. lead to be treated as unity PF for KVAh calculation)
4.21	Energy measurement	Fundamental energy +Energy due to Harmonics.
4.22	Connection Diagram	The connection diagram for the system shall be provided on terminal cover.
4.23	Self-Diagnostic feature	The meter shall have indications for un satisfactory / non-functioning of, i) Real Time Clock ii) RTC battery iii) Non Volatile Memory iv) NIC card
4.24	Initial startup of meter	Meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals.
4.25	Deleted	-
4.26	Clearance between adjacent Terminals.	10 mm (minimum)
4.27	Alternate mode of supply to the meters	In case of meter damage, reading/data should be retrieved with the help of battery
4.28	Sleep Mode	Meter shall not go in sleep mode
4.29	Display	Backlit LCD ,Scrolling ,10 seconds for each parameter
4.30	Software and communication compatibility	The bidder shall supply software required for local (CMRI) & remote (AMI) connectivity including required training to use the software free of cost.
4.31	Security Feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication ,firmware selection from remote etc.
4.32	Usage Application	Indoor and Outdoor
4.33	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However parameters like RTC, TOD tariff, DIP(billing & load survey), billing date, display parameters etc shall be reconfigure through CMRI and remotely over the air(OTA).
4.34	Communication module of meter for AMI	As per clause no 1.2 (b) of IS 16444. Meter should have provision of communication module compatible with both the variant mentioned in IS 16444. This module should be able to get connected to the NAN / WAN network of service provider (RF/ 4G) of CED.

		Meter should be able to provide required power supply to NIC card provided by communication provider shall be approved by CED.
4.35	Harmonics	The meter should record & display THDV and THDI as percentage.

2.3.5. COMMUNICATION CAPABILITIES AND SOFTWARE FEASIBILITIES:

2.3.5.1. The meter shall have facilities for data transfer locally through CMRI (Using optical port/NIC card) and remotely by RF / RF Mesh with proper security via Plug in type NIC or an optically isolated communication port using serial communication. (NIC card will be universal for all make and variants of meters).

2.3.5.2. It should be the responsibility of the bidder to ensure integration of meter into HES (Supplied by RF communication provider)of existing RF-mesh network system of CED. (RF service provider will also support this activity).

2.3.5.3. For cellular fall back, the modem / Module should have backward compatibility.

2.3.5.4. It should be possible to reconfigure the meters for RTC,TOD Tariff, DIP (Demand Integration period), billing date, display parameters etc. through proper authentication process locally through CMRI and remotely over the air (OTA).

2.3.5.5. Necessary keys for performing this reconfiguration on meters should be provided along with supply /subsequently during operations in field.

2.3.5.6. Optical Communication port shall be available for communication via CMRI(conventional),Modem(GSM/GPRS).

2.3.5.7. Communication ports shall not be affected by any type of injection /unauthenticated signals and having proper sealing arrangement.

2.3.5.8. The complete data shall be downloaded within 2 minutes.

2.3.5.9. HES/NIC side integration with meter will be taken care of by RF supplier and meter side integration with HES/NIC will be taken care of by meter supplier. So it will be joint responsibility of meter & RF supplier to ensure integration of meter with head end for data transfer as mentioned in specification. Bidder has to sign an MOU with RF service provider for integration of meter with NIC for sending data up to HES in desired mode.

2.3.5.10. CED expected time for integration of meter with RF module is 12 months from the dated of award of contract. Meter should be supplied to CED along with integrated NIC card (bidder to purchase NIC card from CED approved RF supplier). NIC card should be plug in type with proper sealing arrangement.

2.3.5.11. The bidder shall supply software required for local (CMRI) & remote (AMI) connectivity including required training to use the software free of cost. Bidder shall provide the communication protocol / APIs for communication with meter through local (CMRI) / remote (AMI) as and when required by CED. The bidder should provide DLMS compliance for Communication with the meter at Optical port and at HES.

2.3.5.12. Bidder should also provide software for changing firmware of meters in mass and should support integration of this software with HES. Bidder should also provide base computer software(BCS) for viewing the data downloaded through HES/CMRI/laptop/HHU in separate PC/laptop.

2.3.5.13. API required for converting raw file to XML. (DLMS/OBIS) should also be Provided.

2.3.5.14. For purpose of exercising control, like outage management, the meter should send abnormalities like Power failure (Last Gasp), Power Restoration (First Breath), CT secondary current is >90% and unbalancing of CT secondary current among three phases CTs is > 50%. This values should be configurable through remote in single/broadcast mode. Additional exceptional events should also be communicated to HES by meter immediately after the occurrence through RF / RF Mesh. It should also indicate the restoration of the same event. List of events to be reported should be configurable over the air(OTA). The meter should have "Last Gasp" and "First Breath" feature to facilitate sending alerts to the HES during fully powered off / On condition.

2.3.5.15. Two way communications between:

2.3.5.15.1. Base Station (HES) and Data Concentrator Unit (DCU) shall be through Cellular (GPRS/ 3G / 4G / LTE) / Fibre/ Ethernet or any other suitable media preferably on RF , depending upon suitability and choice of CED.

2.3.5.15.2. Meter and Intermediated Communication Network Elements (if Exists) and/or Data Concentrator Unit through RF/ Hybrid (combination of RF). Intermediated Communication Network Elements (if Exists) and Data Concentrator Unit (if different & if applicable) through RF/ Hybrid (combination of RF).

2.3.5.15.3. If there are 2 requests given for communication one from HES and other from local device, request from local device should supersede.

2.3.5.15.4. Last mile mesh network must support auto-registration and self-healing feature to continue operation using easiest possible available route in case of failure of any communication device in the mesh. Meter Serial no will be used for tagging of all data of the meters in all database (at HES / MDM/ DCU level etc.). However, it will be the responsibility of the Bidder to establish the complete communication solution involving all the meters in the system. Also, the Bidder must ensure that, the mode of communication used for RF shall be consistent with the Government of India stipulations. Bidder should come out with their requirements for integration of meter with HES and MDMS clearly during tender submission.

2.3.5.15.5. The Bidder's supplied meter with third party communication module should have suitable hand-shaking features to allow a third-party MDMS to configure, command, read and control smart meters installed at site. The Bidder shall extend all necessary assistance in developing the adaptor software through a third-party for facilitating the above.

2.3.5.15.6. Integration of meter software's with HES / MDMS for seamless transfer of data will also be in scope of bidder till useful life of the meters. It is desired firmware up gradation/selection should be available over the air. Integration of HES with MDMS will not be in scope of bidder, however if any support is required then same should be provided.

2.3.5.15.7. Bidder should make necessary arrangements for CED approval of dimensions / Specifications of the NIC card module which need to be used in meter for integration.

2.3.5.15.8. Communication of the meter at optical port /OTA (NAN/WAN) should be as per IS 15959 (Part-2):2016.

2.3.5.15.9. There should not be any reservation of bidder on a particular frequency band to be used for communication.

2.3.5.15.10. Communication network should be immune with any external Magnetic field/ESD/Jammer/HV voltage influence such that it shall not affect the normal overall functionality.

2.3.5.15.11. Backward compatibility of MDAS with hardware (meters and communication devices) and vice-versa is required for any future upgradation of hardware / software and this is an essential pre-requisite for supply.

2.3.5.15.12. Meter once powered up with NIC card should be self-detected by RF network and its basic name plate details, instantaneous & billing parameters are transferred to HES automatically.

Note: Necessary TOD registers for energy and demand shall have to be incorporated while designing the meter under this specification, since in future the same meter may have to be modified, through the downloading of relevant software on to the meter, to convert the meter into an import-export (four quadrant) meter, if required.

2.3.6. ABNORMAL AND TAMPER CONDITIONS

2.3.6.1. The meter shall record forward energy under all abnormal tampering conditions. The meter shall be capable of recording occurrence and restoration of abnormal events listed below along with date & time and snap shots of individual voltages, currents, power factors, active energy and apparent energy at the time of occurrence of abnormal event and restoration of normal supply. During abnormal and Tamper conditions, the current shall be recorded as active current and line current. Each such event shall be provided with minimum 25 Nos of counts to avoid missing of data amidst usual events (like power failure) due to the limitation of FIFO. Persistence time for occurrence and restoration for the events along with their threshold values shall be as per table given below.

Meter should count & duration of all cumulative events of all registers.

Table 29

Persistence time for occurrences	Persistence time for restoration	Threshold value for Occurrence event.	Threshold value for restoration event.

PT Missing=0 Hr 5 Min 0 sec	PT Missing=0 Hr 5 Min 0 sec	Voltage <70% of Vref:and current > 2% Ib.	Voltage >80% of Vref:and current > 2% Ib.
Voltage Unbalance=0 Hr 5 Min 0 sec	Voltage Unbalance=0 Hr 5 Min 0 sec	20% or more between the phases and current >2% Ib	Shall be less than 10 % between the phases and current > 2% Ib.
CT Open (phase wise) = 0 Hr 5 Min 0 sec	CT Open (phase wise) = 0 Hr 5 Min 0 sec	Ir + Iy + Ib + In≥ 10 % of Ibasic (vector Sum). AND Phase current < 1% of Ibasic with All current +ve.	Ir + Iy + Ib + In <5 % of Ibasic. (vector Sum) AND Phase current > 10% of I basic with All current +ve.
CT Reversal=0 Hr 2 Min 0 sec	CT Reversal=0 Hr 2 Min 0 sec	Activecurrent negative	Active current positive
CT Bypass=0 Hr 5 Min 0 sec	CT Bypass=0 Hr 5 Min 0 sec	Ir + Iy + Ib + In≥ 10 % of Ibasic (vector Sum). AND Phase current >10% of Ibasic with All current +ve.	Ir + Iy + Ib + In <5 % of Ibasic. (vector Sum) AND Phase current > 10% of Ibasic with All current +ve.
Low Power Factor=0 Hr 5 Min 0 sec	Low Power Factor=0 Hr 5 Min 0 sec	PF≤0.5	PF>0.6
Power On Off=0 Hr 5 Min 0 sec	Power On Off=0 Hr 5 Min 0 sec	Actual V- off	Actual V- On
High Voltage=0 Hr 5 Min 0 sec	High Voltage=0 Hr 5 Min 0 sec	Voltage >130% of Vref.	Voltage <110% of Vref.
High Neutral Current=0 Hr 5 Min 0 sec	High Neutral Current=0 Hr 5 Min 0 sec	Ir + Iy + Ib + In > 20%	Ir + Iy + Ib + In < 10%

Note: "Meter shall have neutral CT for tamper identification and analysis."

2.3.6.2. The meter shall record in export registers in case of reversal of CT terminals (either 1, 2 or 3) . The meters are to be used for registration of energy consumed by the consumer, as such the meters shall be programmed for import mode and in case of reversal of energy direction (reversal of either 1,2 or 3 CT terminals) meter shall register energy separately in export mode i.e. in case of CT reversal, meter shall record scalar (not vector sum) sum of energy.

2.3.6.3. The meter shall register correctly if supply neutral is not available at the meter neutral terminal. The meter shall work in absence of any phase. It shall keep recording correctly in case of unbalance system voltage also as defined above.

2.3.6.4. The meter shall keep working accurately irrespective of the phase sequence of the supply. The meter shall be functional even if somehow change in the phase sequence takes place. Meter shall sufficiently record this feature.

2.3.6.5. The meter shall be reprogrammable at site through CMRI or remotely with adequate security level of DT meter.

2.3.7. GENERAL CONSTRUCTIONAL REQUIREMENTS

2.3.7.1. General

The Meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially personal safety against electric shock, safety against effect of excessive temperature, protection against spread of fire, protection against penetration of solid objects, dust and water.

All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions.

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components.

All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy as given below or any other equivalent make with the strict approval of CED:

Table 30

S No	Component Function	Requirement	To be furnished by bidder
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high Voltage spikes or electrostatic discharges.	
3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to	

		read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	
6.	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.	
7.	Battery	Lithium with guaranteed life of 15 years	
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	

2.3.8. METER BODY

2.3.8.1. Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II) with FVo Fire Retardant, self -extinguishing, UV stabilize, recyclable and Anti oxidation properties. The minimum thickness of the meter enclosure shall be 2mm. Meter base shall be opaque of Green color with polycarbonate LEXAN 500R or equivalent on prior approval from the CED. Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the CED. Meter cover & base shall be provided with Ultrasonic/Chemical welding/Push fit mechanism or combination in such a way that it is not possible to open the meter box without breaking (break-to-open design) the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence. The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s). Unidirectional screws to be used on meter covers where ever required.

2.3.8.2. Meter PCB chamber should be hermetically sealed and pins for connecting NIC card should come out from this hermetically sealed compartment in an adjoining slot where NIC card can be push fit and sealed using CED sealing arrangement.

2.3.9. TERMINALS, TERMINAL BLOCK

2.3.9.1. Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block adequate testing of materials shall be taken into account. Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the test given in ISO 75 for temperature of 135°C and pressure of 1.8 M Pa. The terminal block shall be of opaque with polycarbonate LEXAN500R.

2.3.9.2. The terminals and connections shall be suitable to carry up to 120 % of Imax continuously.

2.3.9.3. The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

2.3.9.4. The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.

2.3.9.5. Deleted.

2.3.9.6. Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

2.3.10. TERMINAL COVER

Terminal cover shall be of short type and shall be transparent with polycarbonate LEXAN 143R/943A. Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be got approved from CED). After sealing the cover, terminals shall not be accessible without breaking the seals.

2.3.11. SEALING OF METER

2.3.11.1. Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. For this, one no. Polycarbonate seal and one no. Hologram seal shall be provided by CED. One no polycarbonate seal and one no. hologram seal shall be provided by the bidder. All the seals shall be fixed on meter body by the bidder at his works before dispatch.

2.3.11.2. One sealing provision shall be provided at meter terminal cover; such that terminal shall not be accessible without breaking the seals. All the seals shall be provided on front side only and as per CED specification. Rear side sealing arrangement shall not be accepted. Bidder shall provide seals be as per CEA regulation (2006).

2.3.11.3. Plug in type NIC card should have proper sealing arrangement.

2.3.12. MD INTEGRATION

The MD integration period shall be 30 minutes (integration period- programmable by CMRI at site and also through remote with adequate security level. The MD resetting

shall be automatic at the 1st of the month i.e 00:00 hours of 1st of the month. Manual MD reset button shall not be available. Last six MD values shall be stored in memory and four to be displayed in auto scroll mode. MD shall be recorded and displayed with minimum two digits after decimal points. MD integration shall be of sliding method, not in time block.

2.3.13. TOD FEATURE

The meter shall be capable of measuring Cumulative Energy (KWh & KVAh), and MD (KW & KVA) with time of day (TOD) registers having 8 zones & 02 seasons (no. of zones & time slot shall be programmable by CMRI with adequate security level and in one to one /broadcast mode over the air). Midnight snap shot of TOD value also required (Optional). Current TOD to be given during tender.

2.3.14. LOAD SURVEY

The meter shall be capable of recording 30 minutes average of the following parameters for at least last 60 days

1) Voltage of each phase
2) Current of each phase
3) PF of each phase
4) Total KWh
5) Total KVAh
6) KVArh(Lagging)
7) KVArh(Leading)
8) Neutral Current
9) Frequency
10) THDV
11) THDI

Note- Meter shall record consumption in forward mode in case of any CT reversal

2.3.15. DISPLAY UNIT

The display unit shall be Pin type built-in liquid crystal display (Permanently backlit type LCD). The LCD shall be of STN (Super Twisted Nematic) construction suitable for maximum temperature withstands 65 C degree and minimum temperature withstands 0-degree C during normal operating condition. The LCD display shall have a wide viewing angle of 120 degrees. When the meter is not energized the electronic display need not be visible. The display shall not be affected by electrical and magnetic disturbances. The display should be readable in direct sunlight.

The KWh & KVAh register shall have minimum 8 digits and size of the digits shall be minimum 10mmx5mm. Cumulative energy (KWh & KVAh) shall be displayed without decimal in auto scroll mode. (However decimal shall be available in push button mode for high resolution display for testing).

2.3.15.1. Auto scroll mode

Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (i.e. if MD1 is displayed in Auto scroll mode, Header (as given in ix

below) and value (say 5.23 KW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 10 sec, if push button is not operated.

Following shall be continuously displayed in auto scroll mode in the given order;

Table 31

Sr. No.	Auto Scroll Display
1	LCD CHECK
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.
3	d- dd:mm:yy
4	t- hh:mm:ss
5	b 1 KWh KWh reading on 1st of last month at 00.00 hrs.
6	b 2KWhKWh reading on 1 st of second last month at 00.00 hrs
7	b 1KVAh KVAh reading on 1st of last month at 00.00 hrs
8	b 2KVAh KVAh reading on 1st of second last month at 00.00 hrs.
9	d 11MD KW MD in KW on 1st of last month at 00.00 hrs.
10	d 21MD KW MD in KW on 1st of second last month at 00.00 hrs
11	d 12MD KVAMD in KVA on 1st of last month at 00.00 hrs
12	d 22MD KVAMD in KVA on 1st of second last month at 00.00 hrs.
13	b 1PF Average power factor of entire month on 1st of last month at00.00 hrs
14	b 2PF Average power factor of entire month on 1st of second last month at00.00 hrs
15	C KWh Current Cumulative KWh
16	C KVAh Current Cumulative KVAh
17	C KVARh lag Current Cumulative KVARh(lag).
18	C KVARh lead Current Cumulative KVARh(lead).
19	r 1 MD KW Current MD - KW
20	r 1 MD KVA Current MD - KVA
21	rc MDMD reset count
22	U1VR Phase Voltage (Instantaneous value).
23	U2V Y Phase Voltage (Instantaneous value).
24	U3VB Phase Voltage (Instantaneous value).
25	A1AR Phase Current (Instantaneous value).
26	A2AY Phase Current (Instantaneous value).
27	A3AB Phase Current (Instantaneous value).
28	Pr PF Instantaneous power factor
29	Pr KW Instantaneous load in KW
30	Pr KVA Instantaneous load in KVA
31	NIC card Status (Good / Fail)

2.3.15.2. Push Button Mode:

Following parameters shall be displayed in Push button mode in the given order after display of all the tamper events.

Table 32

Sr. No.	Push Button Display
1	LCD CHECK
2	Meter Sr. No.* > Complete Meter Serial no. should be there in single shot.
3	d- dd:mm:yy
4	t- hh:mm:ss
5	b 1 KWh KWh reading on 1st of last month at 00.00 hrs.
6	b 2KWhKWh reading on 1 st of second last month at 00.00 hrs
7	b 1KVAh KVAh reading on 1st of last month at 00.00 hrs
8	b 2KVAh KVAh reading on 1st of second last month at 00.00 hrs.
9	d 11MD KW MD in KW on 1st of last month at 00.00 hrs.
10	d 21MD KW MD in KW on 1st of second last month at 00.00 hrs
11	d 12MD KVAMD in KVA on 1st of last month at 00.00 hrs
12	d 22MD KVAMD in KVA on 1st of second last month at 00.00 hrs.
13	b 1PF Average power factor of entire month on 1st of last month at00.00 hrs
14	b 2PF Average power factor of entire month on 1st of second last month at00.00 hrs
15	C KWh Current Cumulative KWh
16	C KVAh Current Cumulative KVAh
17	C KVARh lag Current Cumulative KVARh(lag).
18	C KVARh lead Current Cumulative KVARh(lead).
19	r 1 MD KW Current MD - KW
20	r 1 MD KVA Current MD - KVA
21	Pr KW Instantaneous load in KW
22	Pr KVA Instantaneous load in KVA
23	Pr PF Instantaneous power factor
24	rc MDMD reset count
25	U1VR Phase Voltage (Instantaneous value).
26	U2V Y Phase Voltage (Instantaneous value).
27	U3VB Phase Voltage (Instantaneous value).
28	A1AR Phase Current (Instantaneous value).
29	A2AY Phase Current (Instantaneous value).
30	A3AB Phase Current (Instantaneous value).
31	P1 PFR phase power factor(Instantaneous value).
32	P2 PFY phase power factor(Instantaneous value).
33	P3 PFB phase power factor(Instantaneous value).
34	SE Uryb:Aryb Phase Sequence
35	A 000Anamoly
36	C 1MDKW Cumulative MD-KW
37	C 2MDKVACumulative MD-KVA

38	1 RD KWRising Demand in KW with elapsed time
39	2 RD KVARising Demand in KVA with elapsed time
40	NIC card Status (Good / Fail)

All these parameters shall be downloaded locally or remotely and interpreted in PC/Laptop. All the parameters shall be recorded and memorized in its Non-volatile Memory (NVM). The corresponding non-volatile memory shall have a minimum retention time of 10 years. Last six months' history data (KWh &KVAh) reading and MD(KW& KVA) with data and time) and at least last six tamper events for each tamper shall be available in the non-volatile Memory.

2.3.16. OUTPUT DEVICE

2.3.16.1. Pulse Output

The meters shall have a suitable test output device. 2 nos of Red colour blinking LED (marked as imp/kWh and imp/KVAh)shall be provided in the front. This device shall be suitable for using with sensing probe used with test benches or reference standard meters. The test output device shall have constant pulse rate of 400 pulse / kWh & 400 pulse/KVAh. Meter constant shall be indelibly printed on the name plate as 400 imp / KWh & 400 imp/KVAh.

2.3.16.2. Communication LED

The meter shall be provided with Green color LED for RxD and orange color LED for TxD communication in progress.

2.3.17. Mid Night Values

Meter should have mid night log for KWh, KVAh, KVARh lag, KVARh lead and TOD readings for last 60 days.

2.3.18. Name plate and Marking

Meters shall have a name plate clearly visible and effectively secured against removal. Indelibly and distinctly marked with all essential particulars as per relevant standards along with the following.

- i. Manufacturer's name
- ii. Type designation
- iii. Number of phases and wires
- iv. Serial number
- v. Month and Year of manufacture
- vi. Unit of measurement
- vii. Reference voltage, frequency
- viii. Ref. temperature if different from 27 deg. C
- ix. Rated basic and maximum Current
- x. Meter constant (imp/kWh)
- xi. 'BIS' Mark

    xii.   Class index of meter

    xiii.   "Property of CED"

    xiv.   Purchase Order No. & date

    xv.   Guarantee period.

    xvi.   Rated frequency

    xvii.   Sign of double square

    xviii.   Country of manufacture

    xix.   Communication Tech for WAN and NAN (with carrier frequency)

    xx.   Communication Technology is IHD supported (with carrier frequency)

However, the following shall be printed in bar code on the meter nameplate.

    i.   Manufacturer's code No. (given by CED)

    ii.   Meter Sr. No

    iii.   CED Property

    iv.   Month/Year of manufacture.

2.3.19. TEST

All routine, acceptance & type tests shall be carried out on the meter and meter body separately in accordance with the relevant IS/IEC. All routine/acceptance tests shall be witnessed by the purchaser/his authorized representative. All the components shall also be type tested as per the relevant standards. Following tests shall be necessarily conducted in addition to the tests specified in IS/IEC.

2.3.19.1. Type Test

2.3.19.1.1. All tests as defined in IS 14697:1999/ IS 15959(Part-2):2016

2.3.19.1.2. Type test of the Material used for Terminal Block and meter body as per relevant standards.

2.3.19.2. Routine Test

2.3.19.2.1. AC High Voltage test

2.3.19.2.2. Insulation test

2.3.19.2.3. Test on limits of error

2.3.19.2.4. Test of starting current

2.3.19.2.5. Test of no load condition

2.3.19.3. Acceptance Test

2.3.19.3.1. AC High Voltage test

2.3.19.3.2. Insulation test

2.3.19.3.3. Test on limits of error with loads

120% I max (12A)	I max(10A)	Ib(5A)	0.5Ib(2.5A)	0.1 Ib(0.5A)	0.05 Ib(0.25A)
UPF,0.8 lead & 0.5 lag	UPF,0.8 lead & 0.5 lag	UPF,0.8 lead & 0.5 lag	UPF,0.8 lead & 0.5 lag	UPF,0.8 lead & 0.5 lag	UPF

2.3.19.3.4. Test of meter constant

2.3.19.3.5. Test of starting current

2.3.19.3.6.   Test of no load condition

2.3.19.3.7.   Test of repeatability of error

2.3.19.3.8.   Test of power consumption

2.3.19.3.9.   Test to influence of harmonics

2.3.19.3.10. Supply voltage and frequency variation test

2.3.19.3.11. Testing of self-diagnostics features and tamper count increment and logging with date & time

2.3.19.4.   Special Test

The bidder shall demonstrate the communication capability of the meter through communication modes as defined in the specification before conducting acceptance tests. The bidder shall ensure that API (Application protocol interface) is compatible with CED'S CFW.

2.3.20.   TYPE TESTS CERTIFICATES

The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI or equivalent as per the relevant standards. For communication testing any national approved laboratory or international acclaimed lab or equivalent will also suffice at the discretion of CED. Type test should have been conducted in certified Test Laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to CED.

2.3.21.   PRE-DISPATCH INSPECTION

The   successful   bidder   shall   submit   testing   and   compliance reports/certificate/manuals/documents as per specifications and getting approval before mass manufacturing. Inspection may be made at any stage of manufacture at the discretion of the purchaser of the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection.

Equipment shall be subject to inspection by a duly authorized representative of the RECPDCL. Bidder shall grant free access to the places of manufacture to RECPDCL representatives at all times when the work is in progress. Inspection by the RECPDCL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by RECPDCL.

Following documents shall be sent along with material:

   a)   Test reports
   b)   MDCC issued by CED
   c)   Invoice in duplicate
   d)   Packing list
   e)   Drawings & catalogue

f) Guarantee / Warrantee card

g) Delivery Challan

h) Other Documents (as applicable)

i) One no. leaflet with each meter

NOTE- Photographs of packed lot clearly showing s.no of meters whose inspection call has been requested should be sent along with letter for inspection call.

2.3.22. INSPECTION AFTER RECEIPT AT STORE

The material received at CED's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection and one copy of the report shall be sent to RECPDCL and CED each.

2.3.23. GUARANTEE

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the purchaser up to a period of at least 60 months from the date of Project Go-Live, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame, and to the entire satisfaction of the purchaser, failing which the purchaser will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

2.3.24. PACKING

Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The material used for packing shall be environmentally friendly.

Packing and transportation shall be as per IS 15707:206 clauses 9.1 and 9.2. Routine test report of the individual meter shall be kept inside each card board carton of the meter. Each meter should be packed in separate cardboard box and these meters can then be furthered packed into bigger boxes which will contain 10 meters arranged in S.no.

Leaflet: -The Vendor shall supply 1 no. leaflet with each meter. The leaflet shall be coloured and shall contain General features and specifications as per CED requirement. A picture of the meter shall be printed on the leaflet. Prior to delivery, the vendor need to submit the same for approval.

2.3.25. QUALITY CONTROL

The bidder shall submit with the offer 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.

Quality should be ensured at the following stages:
- At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.
- At insertion stage, all components should undergo computerized testing for conforming to design parameter and orientation.
- Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipment (ATEs).
- Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will be kept in ovens for 72 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 72 hours meter should work satisfactorily).

The Purchaser's engineer or its nominated representative shall have free access to the bidder's/manufacturer's works to carry out inspections.

2.3.26. MINIMUM TESTING FACILITIES

Bidder shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant International / Indian standards. The bidder shall have duly calibrated Reference Standard meter of Class 0.05 accuracy.

2.3.27. MANUFACTURING ACTIVITIES

The successful bidder will have to submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart shall be in line with the Quality assurance plan submitted with the offer. This bar chart will have to be submitted within 15 days from the release of the order.

2.3.28. SPARES, ACCESSORIES & TOOLS

40 nos of optical cord for retrieving the data of meter through optical port should be provided, if design of optical port is changed from those of previously supplied meters.

2.3.29. DRAWINGS

Following drawings & Documents shall be prepared based on CED specifications and statutory requirements and shall be submitted after the award of contract for approval:

a. Completely filled-in Technical Parameters.
b. General arrangement drawing of the meter
c. Terminal Block dimensional drawing
d. Mounting arrangement drawings.
e. General description of the equipment and all components with makes and technical requirement
f. Type Test Certificates
g. Experience List
h. Manufacturing schedule and test schedule

Drawings/documents to be submitted after the award of the contract:

Table 33

S. No.	Description	For Approval	For Review Information	Final Submission	Final Submission
1	Technical Parameters	√		√	√
2	General Arrangement drawings	√		√	√
3	Terminal block Dimensional drawings	√		√	√
4	Mounting arrangement drawing.	√		√	√
5	Manual/Catalogues		√		
6	Transport/ Shipping dimension drawing		√	√	√
7	QA &QC Plan	√	√	√	√
8	Routine, Acceptance and Type Test Certificates	√	√	√	√

All the documents & drawings shall be in English language.

After receipt of the order, the successful bidder shall be required to furnish five copies of all relevant drawings for CED approval.

2.3.30. GUARANTEED TECHNICAL PARTICULARS

Successful Bidder must ensure to furnish following GTP after award of contract for approval:

Table 34

S.No	Description	Units	As Specified by CED	As Furnished by Bidder
1	Operating Voltage	V	Meter shall be operational with required accuracy from 0.6 Vref to 1.2 Vref.	
2	Operating Frequency	*Hz*	$50 \pm 5\%$.	
3	Ib & Imax	A	Ib=5A, Imax-10 Amps	
4	Power consumption	VA	As per Cl.4.7	
5	Accuracy Class		0.5s	
6	Starting Current	mA	5 mA(0.1% of Ib)	
7	Short time over current(Secondary)	A	200A for 0.5 sec(20 Imax for 0.5 sec)	
8	Impulse withstand &	KV	6 & 4	

	AC withstand Voltage			
9	Minimum Insulation resistance	M ohm		
	e) Between frame & Current, voltage circuits connected together:		a) 5	
	f) Between each current (or voltage circuit) & each and every other circuit.		b) 50	
10	Degree of protection		IP 51, but without suction in meter	
11	Power factor range		Zero lag to Zero lead	
12	Energy measurement		Fundamental + harmonics	
13	Self-diagnostic feature		As per specification.	
14	Communication capabilities as per clause 4.36		As per Specification.	
15	DI/DO as per Cl 4.37.6		Yes/no	
16	Meter body		a) Ultrasonic/Chemical welding shall be provided between cover and base. b) Base: opaque – LEXAN 500R or equivalent. c) Cover: transparent– LEXAN 143R/LEXAN 943A.or equivalent. d) min. 2mm thickness e) Colour-Green	
17	Tamper/ abnormal count		Tamper count shall be increased in case of all tamper events as defined in 4.37	
18	Recording forward energy in case of current/potential reversal.		Meter shall record forward energy in all conditions as given in clause 4.37	
19	Components used		Components shall be of	

			requirement stated and bought from reputed make as defined in clause 5.1. Details shall be submitted along with the bid.	
20	Terminal block		As per Specification.	
21	Depth of the Terminal holes	mm	25 mm (minimum)	
22	Internal diameter of terminal holes	mm	5.5 (minimum)	
23	Clearance between adjacent terminals	mm	10 (minimum)	
24	Material of the terminal block		a) Terminal Block: LEXAN 500Ror equivalent b) Terminal Cover: LEXAN 143R/ 943Aor equivalent	
25	Non Volatile memory		Minimum 10 years retention period.	
26	Measuring elements used in the meter		To be furnished be bidder	
27	Power supply to circuit (Through common CT/Battery)		Bidder to furnish complete Details.	
28	Display of measured values		As per specification	
29	LCD display		Pin type built in LCD. Shall be of STN, Industrial grade. Viewing angle is 120 degree. Properties/ test reports of the display shall be submitted by the bidder.	
30	Pulse rate	Imp/ KWh Imp/ KVAh	To be furnished by bidder.	
31	Name plate marking		As per Specification	
32	Type test		As per specifications	
33	Acceptance test		As per specifications	
34	Routine test		As per specifications	
35	Test reports		Meter shall be packed along with individual routine test report, while dispatching.	

| 36 | Guarantee | | As per specification | |

2.3.31. SCHEDULE OF DEVIATIONS

Bidders must submit the No-deviation form as per the Form IV format.

3. HEAD END SYSTEM (HES)

The HES shall provide the means to monitor the network's status from end-to-end and the status of each and every device (RF signal strength, dynamic status of links with colour-codes, throughput, available bandwidth etc.) in the network in real-time, and provide performance and activity statistics. The NMS shall support at least SNMPv2. Additionally, the Hardware for the Network Management System is expected from the bidder. Bidder to provide complete configuration of hardware and software with pricing schedule of individual items. Head End System should be fully redundant and in hot standby mode. Standby HES system should be commissioned at 2 different locations. The HES shall have the following in-built module:

3.1. AMI module: This module shall support automatic meter reading, revenue management, remote connect/disconnect, load control, peak pricing, demand side management, Secure management for all types of signals/alerts to endpoint devices/from the end points, data gap reconciliation (i.e., gap detection, gap collection and gap retry), street lighting management & reporting.

3.2. Operational management module: This shall enable two-way communications over the common communication gateway with the communication modules, connected with the Grid management/control devices at site with associated reporting. HES also shall serve as the control and monitoring hub for sending commands to end points individually/ in defined groups or across the entire network.

3.3. Security module: This is an additional module, attached to the HES, for secure storage & to process security keys & certificates.

3.4. Firmware Upgrader: This shall enable the utility to upgrade Firmware in the communication devices/meters over the air (OTA) in batch mode in bulk.

3.5. Network Management Module (NMM): The HES shall indicate mesh network topology status, summary status by service type/ device type and events type, with the following features:
   - Advanced configuration & visualization
   - Real time & historical information
   - Support external interfaces
   - Auto registration & self-healing
   - Dynamic network discovery
   - Backhaul flexibility & redundancy
   - Network provisioning
   - Performance monitoring
   - RF connectivity analysis
   - Trouble shooting
   - Security management

Network management system, inbuilt in the HES, shall be on open standard, interoperable and shall support third party network equipment.

3.6. Power Quality Monitor (PQM)

Power quality related information such as voltage, frequency and harmonics can be visualized device wise/ area wise with the help of this module.

3.7. Functional Requirements

3.7.1. Bidder to provide the sizing of necessary hardware and software required to implement AMI for 30,000 meters scalable to 2,00,000 meters. Front end devices should be sized for 30,000 meters which is scalable to 2,00,000 meters and backend IT systems should be sized to 2,00,000 meters so that in future no additional cost to be incurred for backend IT Infra.

3.7.2. List of preferable hardware / software is listed below for reference.

- Head End System/Meter data acquisition software (HES/MDAS)
- Meter data management (MDM) capable of processing raw data, building of desired analytics (Meter data Analytical tool as per of MDMS)like giving demand response signal, taking control/programming actions based on pre-set logic, interface with billing software being used by utility.(30,000 Nos. of consumers and scalable up to 2 Lakhs, however initial licensees would be for 30000 consumers)
- Data archiving and SAN management software
- Centralized network management software along with patch management & identity management
- Antivirus software for all machines in control center.
- Application Server suitable for HES/MDAS, MDM, along with operating system.
- Application server with minimum 4GB RAM for development, quality and testing.
- Web Server for access
- SAN based storage for storing Smart Meter data, data from MDM, SCADA, DTMU for2years with 100% expansion capacity to cater 2,00,000 meters data requirement.
- Data Archiving Server and Application
- Network management server with patch and identity management
- Firewall
- Routers
- LAN Switch

3.7.3. Network Management, Monitoring and Control

The head end system shall support centralized remote management, monitoring and control of all communication network and communication equipment, including the tracking of necessary system component.

3.7.4. Meter Provisioning

The head-end system shall support self-discovery and self-registry functionality to detect and register meters within 60 minutes of meter connection and establishment of communication. The system shall allow inputs via manual data entry or data files for the necessary meter provisioning data.

3.7.5. Billing Support

The head end system shall support on-cycle and off-cycle billing reads.

3.7.6. Diagnostic and Performance Report

The system shall provide daily, weekly and monthly performance reports tracking equipment failures, communications failures, and data latency for all customer and equipment classes. Reports shall be generated in common commercially available reporting tools.

3.7.7. Energized Check

The head end system shall support meter energization checks (on-demand pings) by meter/customer or batch of meters/customers.

3.7.8. On-Demand Read

The head end system shall support on-request reading of any available information by meter/customer or batch of meters/customers.

3.7.9. Revenue Integrity Monitoring

The head end system shall support revenue integrity monitoring across the entire meter/customer population including, but not limited to, meter tamper, energy diversion, site diagnostics, and load diagnostics.

3.7.10. Outage Management

The head end system shall provide outage detection notification and power restoration notification information in support of enhanced outage management and improved customer satisfaction.

3.7.11. Physical Disconnect/Reconnect

The head end system shall support the physical disconnect/reconnect functionality.

3.7.12. Load Limiting

The head end system should support the load limiting functionality.

3.7.13. Web-Based User Interface

The head end system should provide web-based user interfaces.

3.7.14. Pre-Payment/Prepaid Functions

The head end system should support pre-payment capabilities.

3.7.15. The HES system should comply with the communication protocol as defined in IS standard 16444 and IS 15959 (for data exchange for electricity meter reading tariff and load control) including latest amendments.

3.7.16. The HES must be able to communicate with the access point / router/DCU which support communication protocol of RF, PLC and cellular.

3.7.17. The HES shall have an excellent capability of reporting all sorts of status, alerts and transactions for both AMI & Grid management on real time as well as historical basis.

3.7.18. The HES shall be flexible and on open standard so that it can communicate with third party communication devices. The HES shall support web based multiple data

base support software and also support standard integration Multi-also support standard integration Multi-speak and CIM IEC 61968 for third party MDMS.

3.7.19. Deleted

3.8. Cyber Security

The HES system shall have adequate cyber security measures as detailed below:

3.8.1. Secure Access Controls

The system shall include mechanisms for defining and controlling user access to the operating system environment and applications. Measures such as password policy, password strength, password aging, and password history and reuse prevention must be implemented.

3.8.2. 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.

3.8.3. 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 to the least-privilege concept mentioned above, so that entries may not be deleted, accidentally or maliciously.

3.8.3.1. 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.

3.8.3.2. Malicious Software Prevention

Implementation of anti-virus software and other malicious software prevention tools shall be supported.

3.8.3.3. 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.

3.9. Interfaces

Bidder to provide supporting documentation (OEM / product with version number/ customer reference) of questionnaire on integration of HES with other systems as per below for interfaces after award of contract.

Table 35

1	Does the Bidder implemented an integration with the MDM System?
2	Is this integration real-time, batch, or a combination of real-time and batch?
3	Does the integration support the delivery of different type of meter data and alerts to the MDMS?

4	Does the integration support on-request register reads?
5	Does the integration support the delivery of any interval data to the MDMS?
6	Does the integration support the delivery of power quality data (voltage, outage, sag, swell, etc.)?
7	Does the integration support the remote operation of a meter like connect / disconnect/ load control?
8	Does the integration support the remote reconfiguration of the meters, including change of interval length, change of number of channels, change of tariff (including TOU calendars), and change of alerts without manual interaction or intervention??
9	Does the integration support resetting (both scheduled and adhoc) of demand registers?
10	Is the MDM integration framework based on web services version 2 on SOA framework? Does it also support any other interoperability standards (e.g. IEC 61968, Multi-Speak and CIM)?
11	List a utility currently in operation with your AMI solution which is using the integration to the any enterprise level MDM system.
12	Does the integration support the management, message initiation, and control of load control devices?
13	Does the integration support the provisioning of AMI meters? Provisioning is the automated process of identifying newly installed AMI meters, or removed AMI meters and the interaction with the AMI head end to ensure that the meter and system are correctly configured to deliver the required data on the required schedule. Describe your system's automated processes, flexibility and exception management in support of this activity. Include one reference (for each of the indicated MDM) where this automated provisioning process is in production.
14	Does the integration support the receipt of event logs and alarms? Are all alarms and events supported in the integration?

4.   **METER DATA MANAGEMENT SYSTEM (MDMS)**

   4.1. Functional Modules

   MDM system should support following modules:

- Meter reading processing and developing billing determinant for Domestic, Industrial, Commercial, agricultural, Net Metering, Open access customers etc. as per CED billing requirement.
- Virtual Metering for Customer Service, BI, Energy Audit and Network planning purpose. On demand/scheduled read request processing. Device Management (Detection, Provisioning and Commissioning of Device).
- VEE (Validation, Estimation and Editing)
- Revenue protection module as per CEA guidelines.
- Event Analyser / Reporting.
- Analytical module to handle logics for handling data from different sources to device business logics.
- Outage Event Managers
- Device Control (Remote Connect / Disconnect)
- Pre-payment Module / Support - Shall have the ability to properly account for prepaid metering when calculating billing determinants and sending those to billing and other systems.
- Demand Response Management
- MDMS should support EV CHARGING MODULE
- MDMS should support Universal Calculation Engine with Mathematical, Logical and Statistical Operators.
- Integration for Real time BI system & Standard ETL Process / Tools

This RFP will include supply of all above mentioned modules along with technical specification of required hardware capable to run the supplied software for 50,000 (Pilot Phase) and scalable to 2,00,000 endpoints with a data storage of 2 years for maximum of 16 channels 15/30 Minute of interval data along with other type of all meter data.

This RFP also include installation, commission and testing of the MDMS along with integration of MDMS with other application of CED as asked for in this RFP.

Bidder to complete 100% installation and integration of MDMS within one year from date of PO. Bidder has to provide perpetual license along with warranty from the date of project acceptance to 12 months after Go-Live. On expiry of Warranty bidder to provide FMS for 36 months which may be extended for another period of two years based on same terms and conditions with mutual consent .

Bidder should also provide all the updates free of cost during warranty and FMS period. Bidder should also provide the required training to the users for operating, developing system and administrative training to selective persons for running system after support period free of cost.

Bidder has to provide all the supporting 3rd party software which it recommends for operation of the system free of cost till the FMS period.

- Any software updates, upgrades, patches released till the completion of warranty period shall be supplied, installed and commissioned under scope of agreement / PO / RC. Training to CED employees on software from the OEM or OEM's certified training partner shall be arranged by the bidder. Bidder shall maintain the software on 24X7 basis during and after warranty period as per agreed SLA.
- The Software licenses will be in the name of CED and will be perpetual in nature.
- System will operate in English (British / US) language.
- System should have a reporting system in GUI form which can plot any report using different parameters if meter for user analysis purpose.

4.2. MDMS Technical Specification Requirement

An MDMS shall meet following requirements:

4.2.1. The MDMS system shall support multiple Head-End-System (HES) / AMI System integration.

4.2.2. MDMS features and functionalities shall comply with IEC-61968-9, latest edition, for interfacing with other upstream and downstream systems a framework to achieve interoperability between those systems. It will be responsibility of the bidder to integrate MDMS with other systems deployed in CED as specified in this document.

4.2.3. The MDMS shall have passed EPRI IEC 61968-9 interoperability tests.

4.2.4. The MDMS shall provide storage for all IEC CIM 61968-9 units of measure.

4.2.5. The MDMS shall identify irregular alerts, consumption, alarms, and other abnormal activity and should proactively generates the necessary reports, service orders, or any user defined actions, resulting in operational efficiencies.

4.2.6. The MDMS shall perform complex interval data calculations supporting: addition, subtraction, negative values and multiplication by a different constant based on magnitude.

4.2.7. The MDMS shall have the ability to automatically route validation errors to different electronic work queues based on at least the following data elements: Validation Error, Account Type, Meter Type, or any combination of the above listed.

4.2.8. The MDMS shall have the ability to select which validations apply to accounts based on the following at a minimum: rate category, billing class, customer category, meter type, walking sequence, variable or zero use code, Contract Account, Installation, and Meter ID and Manufacturer.

4.2.9. The MDMS shall have the ability to apply different estimation algorithm based on different missing data conditions (e.g. missing interval in a one-hour gap, missing interval with known scalar reads, missing intervals of an entire billing span, etc.)

4.2.10. MDMS shall re-estimate the Gaps readings if, intermediate any actual reading made available by HES, when it is made available and without waiting until the billing cycle is due.

4.2.11. The MDMS shall suspend processing of the current read and flag any cut off meter data when it encounters some configurable criteria which cause a validation failure.

4.2.12. The MDMS shall revalidate any data if user edits or manually estimates.

4.2.13. The MDMS shall detect multiple flags during any technical validation performed during meter data import including Meter hardware/firmware failures, Communication errors, - Mismatches between the meter configuration and the MDMS meter reference data (e.g., meter program, unit of measure, multiplier or load factor, etc.), Meter replacement, Gaps in data, Alarms/ phase errors reported by the meter (e.g. tamper, outage, phase failure, pulse overflow, CRC error, time tolerance, and theft flags/tampers).

4.2.14. The MDMS shall detect the following during business validation for scalar/time of use/interval data performed during meter data import for Meter rollovers, High/low consumption limits, Negative consumption, High/low checks against a customer profile, Usage on an inactive meter etc. The MDMS shall have the ability to merge and split intervals from different meters or channels into the same account and automatically combine different cuts of data. (Use case Interval Data and RTP) CED would configure the legacy rules based on their business requirement.

4.2.15. The MDMS shall account for information derived from AMI alerts and alarms and from external systems (e.g., outage management systems, etc.) when performing VEE.

4.2.16. The MDMS shall have the ability to perform VEE functions on-request in addition to scheduled VEE process.

4.2.17. The MDMS shall support version tracking of meter read data including the reading source in the event that multiple iterations of the interval values are available as a result of VEE contingency reads, on-request reads, or any other event that may create additional versions of meter read data.

4.2.18. The MDMS shall have the ability to process the meter register read data / Interval data for calculating the billing determinant within one hour of receiving the data from HES. Same should be uploaded in Billing Engine with in this one hour.

4.2.19. We will create Reading Quality Checks which system should follow while uploading reading in Billing Engine and should generate exception log. Reports which authorised user can check and process on case to case and bulk basis.

4.2.20. MDMS should have capability to retain data of 2 million endpoints for last 2 years (All type meter data).

4.2.21. The MDMS shall have the ability to compare summarized interval reads with scalar reads and when estimating, ensure estimates are balanced to the scalar read.

4.2.22. The MDMS shall have the ability for any given meter, to select different versions of reads based on priority of the reading source, and if necessary, combine sources, to satisfy a billing request for reads.

4.2.23. The MDMS shall support the integration of prepayment systems if supplied by third party.

4.2.24. The MDMS shall provide a mechanism to receive disconnect and reconnect commands and transmit them down to the appropriate Head End Systems for

activation and should receive the feedback and update in existing Billing / consumer Information System (If Exists) for same.

4.2.25. Disconnected meters reading should be continued till the meter is de-commissioned and if any reading increment is noticed, an alert should be generated.

4.2.26. The MDMS shall provide a daily summary report of validation errors that occur as part of VEE (VEE Summary Report). The VEE Summary Report shall include the following information at a minimum: Date of Report, Number of Meters that Failed Validation, Number of Validation Errors Sent to the Electronic Work Queue, and Number of Validation Errors Broken Down by Validation Error Type (e.g. high/low check).

4.2.27. The MDMS shall generate a report listing meters that were estimated and the reason for estimation. (Completed VEE) and for which the system could not create billing determinants in a configurable period of time. (Failed VEE).

4.2.28. The MDMS shall provide an estimation report by meter which provides details of all estimations, flags them, as well as identifies gaps where automatic estimation could not occur.

4.2.29. The MDMS shall have configurable capability to prioritize readings that have been manually captured and imported over readings captured remotely and version them as such for the same request for a given billing period.

4.2.30. The MDMS shall have the ability to request specific, current or historical data from the meter.

4.2.31. The MDMS shall have the ability to define groups of meters that will apply unit modifications, e.g. if a meter is read in MWh / MVARh/ MVAh and Billing Engine requires kWh/KVARh/KVAh, to allow Billing engine to process the data, and facilitate the translation.

4.2.32. The MDMS should enable users to define "best read" logic for using multiple and overlapping readings within the same request window. If valid readings cannot be obtained within the reading window, the MDMS can derive an acceptable reading or initiate a new read request using a variety of standard / configurable / newly created business rules.

4.2.33. MDM can be configured to calculate an estimated read, include an invalid reading flagged with an invalid indicator, or invoke an automated gap fill process to re-request readings from the appropriate collection engine.

4.2.34. The MDMS shall associate billing calculations with specific versions of data. It shall also be able to support the versioning and restoration of billing determinants and algorithms to support audits.

4.2.35. The MDMS shall be able to calculate estimated billing based on interval data for dynamic rate structures such as but not limited to Time of Use, Real Time Pricing, Peak Time Rebate, and Critical Peak Pricing.

4.2.36. MDMS should have the capability to create coincident peak from Interval data for all the measured and subsequently virtual meters as per requirement.

4.2.37. The MDMS shall have the ability to perform VEE functions as part of the bill determinant generation process on a meter, or multiple meters, possibly across

multiple service points containing more than one meter, for which there may be multiple reading types (i.e. interval, time of use, scalar, etc.) (Usecase: Multi Meter)

4.2.38. There shall be an indicator / flag marking the version (actual / estimated) of data that was used for billing.

4.2.39. The MDMS shall send billing determinants for all end point meters regardless of whether or not a customer is active. A report of exception should be populated.)

4.2.40. The MDMS shall have the ability to notify users that no actual or missing billing determinants exists if the requested date range for a rebill includes any day with no actual data.

4.2.41. The MDMS shall create work items if data is unable to be estimated during the generate bill determinant process. The system should check for existing work items and update if available.

4.2.42. The MDMS shall update billed versions based on rebill notification (e.g. previous date range version now is "cancelled" and new date range is billed version.)

4.2.43. The MDMS shall support an enterprise Red Hat Linux operating system of enterprise version.

4.2.44. The MDMS shall be capable of running under a virtualized environment.

4.2.45. The vendor shall accommodate the changes recommended by third party security penetration testing performed on the MDMS party just after go live.

4.2.46. The MDMS shall align to Indian Guidelines for Smart Grid Cyber Security.

4.2.47. The MDMS shall support end-Users and Administrator security, including:
- Individual, named accounts for each end-user and administrator
- Role-based security
- Administration privileges provided only through specific authorization
- Configurable, fine-grained access by service delivery point
- LDAP v3 compliant integration
- SSL secured communications

4.2.48. The MDMS shall support system integration security, including:
- Web-services/ SOAP protocol and JMS integration require username/password authentication
- Keystore used to manage certificates and access credentials
- Support for Mutual or 2-Way authentication
- SSL secured communications

4.2.49. The MDMS's underlying data shall support the following security mechanisms:
- Role-based security for database and application administration, application operations and execution, ad-hoc read-only privileges
- AES-256-bit encryption for persisting sensitive data at rest
- Keystore to manage certificates and access credentials
- SSL secured communications

4.2.50. The MDMS shall provide a customer portal offering which provides the following functions:
- Produce interactive charts & heat maps that toggle between interval, hourly, daily and monthly usage

- Compare monthly usage with nearby consumers, i.e. neighbourhoods or with the entire utility population
- View graphical representation of monthly usage totals and bills for past 2 years
- Set energy markers to note efficiency upgrades
- Set energy saving goals
- View PDF of a paper bill along with dynamic web-based bill inserts.
- Send automated notifications and alerts to keep customers aware of real time energy use and outages, and alert them to relevant rebates and other programs that can help lower their bill.
- Provide tools for customer segmentation and insights based on building square footage property use type's age of HVAC and water heating appliances. Details of appliance can be captured.
- Enable custom list development for utility messaging to customers based on property profiles and integrates with existing marketing automation platforms.

4.3. Additional feature: Prepaid Functionality - The prepaid functionality can either be availed at smart meter level or through MDM. In case of MDM, following shall apply:

4.3.1. The MDM should support pre-payment metering and capability to interface (Web and Mobile App)with pre-payment application.

4.3.2. The Mobile application should support presently available different OS platform like Android, iOS, Windows etc.

4.3.3. The prepayment should support the system that payment and connection parameters are stored centrally and the details are being updated to consumer portal/ app.

4.3.4. The system should periodically monitor the energy consumption of prepaid consumer and decrease the available credit based on consumption.

4.3.5. The system should send connect/disconnect command on the basis of available credit as per notified rules & regulations.

4.3.6. The system should send low-credit notifications to the consumer when their balance approaches a threshold.

4.3.7. User Interface (Web and Mobile App) for Utility: User interface for utility to update the credit amount of prepaid consumers to MDM. Such type of user interface before login shall require password & login i.d. for authentication. User interface after getting information like consumer i.d., mobile number & recharge amount etc. shall update the same to MDM. The details of payment information shall also update to consumer through SMS, email etc.

4.3.8. User Interface (Web and Mobile App) for Consumer: Consumers can view recharge history & present balance. Prepaid consumers shall be provided facility to recharge their account by logging on user interface. User interface shall require consumer id., mobile number & password for secure login. This user interface shall be integrated with the present online payment gateway of utility.

E. Service Level Agreement (SLA)

Following SLA will be applicable during and after warranty period under FMS.

1.   ADVANCE METERING INFRASTRUCTURE SLA

   A. Network Performance

Table 36

Network Performance					
S.No.	Requirement	Explanation	Individual Meters	Group of Meters (1,000 Meters)	
				90%	99%
1.	Remote Load Control command (peak demand)	Maximum time to control any load	5 sec	5 – 10 sec	1 minute
2.	Meter loss of supply notification (Last Gasp)	Maximum time to Distribution Management System	30 seconds	5 minutes	30 minutes
3.	Individual meter reading, Disconnect/ Reconnect command and Event Log reporting	On demand read requirement – maximum allowable time	30 seconds	-	-
4.	Command receipt acknowledgement with time stamp of reception	So that performance can be monitored	30 seconds		
5.	Respond with notice of command completion with timestamp	So that NOC has up to date record of network status	5 minutes		
6.	Remote (batch) reading of whole network	Minimum scheduled requirement	-	24 hours	72 hours
7.	Automated meter reporting of kWh power consumption	For customer billing purposes			
8.	Field devices		3 sec		
9	Ping response		3 secs	5 – 10 sec	1 minute
10	Troubleshooting & restoration of communication equipment				

   B. Read Performance & Penalty clause:

Table 37

Read Performance			
Parameter	Minimum requirements	Remarks	
Scheduled Data Performance / Latency			

Interval Reads	80% of readings from total installed base on daily basis		
Consumption Read	80% of readings from total installed base on daily basis		
TOU / TOD DATA (buckets)	80% of readings from total installed base on daily basis		
Monthly Billable Read (3 days billing window) Register Read	99.5% of readings from total installed base; HES to flag for non-compliance cases		
Event Log from endpoints	85% of readings from total installed base		
Unscheduled Data - On demand Reads / Requests			
Single query	<30 seconds for 99% of endpoints		-
up to 100 query	<1 minute for 99% of endpoints	As per penalty clause matrix mentioned below	-
up to 1000 query	<5 minute for 90% of endpoints		-
up to 10,000 query	<10 minutes for 85% of endpoints		-
Total Population (assume BROADCAST max 2000 per collector / DCU)	<10 minutes for 85% of endpoints		-
Unscheduled Data - Outage Alarm Msg. On highest priority			
Prerequisite: Last gasp available in comms module and Battery backup available Routers.			-
Single endpoint	<30 seconds with 85% of endpoints reporting		
up to 100	<60 seconds with more than 85% of endpoints reporting.		
up to 1000	<60 seconds with more than 80% of endpoints reporting.		
up to 10,000	< 120 seconds with more than 80% of population reporting.		
Total Population (assume max 2400 per collector / DCU)	< 120 seconds with more than 80% of population reporting.		
Unscheduled Data - Restoration Alarm Msg.			-

Single endpoint	<30 seconds with 85% of endpoints reporting	Single AMI Meter outage: 95% of messages will be delivered at HES within than 30 seconds and rest of 4% within 2 minutes (considering 99% availability of meters).	
up to 1000	<60 seconds with more than 85% of endpoints reporting.		
up to 10,000	< 120 seconds with more than 80% of population reporting.		
Total Population (assume max 2400 per collector / DCU)	< 120 seconds with more than 80% of population reporting.		
Reconfiguration of endpoint			-
Single endpoint	<30 seconds with 85% of endpoints reporting	RTC, reset date, etc.	
up to 10,000	<120 seconds with 80% of endpoints reporting		
Total Population (assume max 2400 per collector / DCU)	<300 seconds with 80% of endpoints reporting		
Firmware Upgrade of meter / device			-
Single endpoint	<300 seconds with 85% of endpoints reporting		-
up to 1000	<300 seconds with 85% of endpoints reporting		-
up to 10,000	< 10 minutes with 80% of endpoints reporting		-
Total Population (assume max 2400 per collector / DCU)	< 10 minutes with 80% of endpoints reporting		-
Firmware Upgrade of Communication module			-
Single endpoint	<30 seconds with 85% of endpoints reporting		-

up to 1000	<120 seconds with 85% of endpoints reporting		-
up to 10,000	<300 seconds with 80% of endpoints reporting		-
Total Population (assume max 2400 per collector / DCU)	<300 seconds with 80% of endpoints reporting		-

✓ All %ages for SLA are to be calculated over calendar month.
✓ There will be a penalty of additional 1% of monthly FMS for additional drop of 1% in communication availability as per SLA, with maximum up to 10% per parameter.
✓ One end point consider for a penalty in one parameter will not be consider for penalty for other parameter.
✓ There will be penalty of Rs 100 /AMI NIC card / Day for non-communicating for more than 15 days.
✓ Note: Replacement of faulty NIC card in meters will be in scope of bidder, however installation of meter will not be in scope of bidder.

2. MAINTENANCE & SUPPORT SERVICES

2.1. Introduction

The scope of maintenance work shall include a comprehensive maintenance of all the software and hardware provided by the contractor for the various systems and components of AMI system under this project. The maintenance practices to be followed shall be as per ISO 20000 Standard. The essence of the maintenance services is to provide maintenance support for the designated hardware and software, with the goal of meeting the availability as set forth herein. SI is to hand hold the EMPLOYER/UTILITY team to take over maintenance and support services after completion of SI's FMS period. The project/ system devices should allow their functionalities to be upgraded without disruption to the existing functionalities by downloading new software and configuration information.

2.2. Maintenance support

The period of maintenance support shall be from Go-live date till completion of FMS Period.

The nature of maintenance support required for the different type of systems and components are described in the Table 38 Maintenance support and Availability requirements below:

Table 38 Maintenance support and Availability requirements

Sl.no.	System	System Availability requirements
1	Advanced Metering Infrastructure System (AMI System)	99.5%

The system availability shall be measured for entire System. Similarly, the availability of various systems of AMI elements Hardware and Software, Field devices, Communication & Networking Systems shall be considered separately control Centers wise. Individual device availability shall be at least 98%.

For all third party equipment (Hardware & Software) and services (communications) Contractor shall have back to back support along with supply of spare and service level agreement with appropriate response time from OEM/OEM Authorized representatives. Contractor shall be responsible for coordination with the OEM for all matter related to that equipment. But the Contractor shall be responsible for meeting the overall response times and availability requirements specified below.

The maintenance of the System shall be comprehensive and shall comprise of the following category of works which is further elaborated for each of the different subsystems:

(a) Preventive Maintenance Activity (performance monitoring, system backup, patch management, updates and troubleshooting)

(b) Maintaining a minimum no. of specified spares.

(c) Integration of new equipment (Field devices, central systems, Communication & networking systems) and integration of a new or existing central system.

2.2.1.Preventive Maintenance Activity

The preventive maintenance activity are be performed by the Contractor to keep the system running at optimum level by diagnosis and rectification of all hardware and software issues and would broadly include.

- There should not be any unnecessary and unscheduled downtime of system services.

- Configuration of the replaced hardware and software, periodic routine checking as part of a preventive maintenance program (as described in further detail in this document) which would include checking of functionality of hardware and software,

- Monitoring of the performance of the system and doing necessary tuning for optimum performance to accommodate any changes such as addition of new components.

- Providing all necessary assistance to Employer/Utility for addition and modification of database and displays, Database sizing activities including Backup and restore of the system

- Restoration of the systems upon its failure and to restore the functioning of the various systems at the central systems

- Log analysis to zero in developing issues

Routine works and other day-to-day operational activity would primarily be the responsibility of Owner and in case of any difficulty in this regard the same shall be referred to the contractor for support.

1.9.1. Hours of Cover

The Contractor shall provide engineers who have an experience and skill to maintain the Smart Grid System to the desired level of availability. The contractor's on-site support for central systems, shall be standard hours of service i.e. Monday to Saturday- 9:00 am to 5:30 pm local time (IST), excluding public and Owner Company holidays, throughout a year. At least one experienced personnel having expertise in AMI System shall be available during the standard hours of service. The timings for Emergency Support would be 24 hours a day, 7 days a week throughout the year.

The support personnel so deployed shall be qualified personnel having at least 3 years of experience in the delivered AMI elements/parts. The contractor shall submit the CV's and recommendation letter from customers for all support personnel(s) to Employer/Utility for approval before deployment at site. The Employer/Utility can ask the Contractor to replace the personnel deployed for maintenance support if his performance is not found to be satisfactory. Notwithstanding anything, the persons deployed in the premises of the Employer/Utility shall not be eligible for benefit/allowances as for permanent employees of the Employer/Utility.

2. Service Response requirements

The severity levels are defined in coming sections and the requirement of response time for various severity levels is defined below:

Emergency Support for Severity 1 issues are to be provided 24 hours a day, seven days a week. The on-call support team shall include all key technical competencies so that any aspect of a system failure can be attended. The team shall comprise of experienced technical staff that are skilled in troubleshooting of the various systems covered under FMS. Severity 1 problems shall be reported by telephone for rapid response; target response times are defined in this section. For severity 1 problems, the key objective is to restore the system to an operational state as quickly as possible, including by a temporary workaround. Resolution of the defect may be completed during standard hours.

Severity 2, 3, and 4 problems shall be reported by Owner/Employer/Utility through a call tracking system to be provided by the contractor. Resolution of problems may also be provided by an individual fix that will be installed by the contractor at no extra cost to Owner.

2.9. Monitoring

The operation and performance of the various systems under FMS shall be monitored on a bi-weekly basis; the contractor shall review the following, analyze the results, and submit report to Owner. The contractor shall conduct at least the following monitoring, for the all Control Centres.

2.9.1. *Log Monitoring*

- System logs for a selected day

⬜ System history log

⬜ Aggregate data collection

⬜ Events Collection

During monitoring if any defect/ abnormality is found, the contractor shall undertake corrective maintenance for the same.

2.9.2. *Resource Monitoring*

Resource Monitoring services comprises checking the system's major node resources, gather log data, analyze results, and advise Owner/Employer/Utility on the appropriate actions to be taken and undertake any agreed upon actions. The supplied system tools shall be used to continuously collect the following information:

⬜ CPU loading (Peak and Average)

⬜ Memory utilization (Peak and Average)

⬜ Disk utilization (Peak and Average)

⬜ LAN/WAN utilization (Peak and Average)

⬜ Operating system resource utilization

⬜ System error log

The SI shall submit the procedures details to meet the above along with the offer.

2.9.3. *Cyber security System monitoring*

The Contractor shall also be responsible for monitoring of the cyber security system, if provided. The logs of the system shall be analyzed for exceptions and the possible incident of intrusion/trespass shall be informed to the Employer/Utility.

The monitoring shall encompass the various cyber security devices installed at Control Centre such as firewalls, Intrusion prevention system (both network based and host based), routers. The Centralized Monitoring Console (CMC) shall monitor and continuously collect the above logs. The Cyber security system shall also be subjected to Annual Security Audit from CERT-In listed auditors at the cost of the Contractor. Contractor shall implement the recommendations/remedial actions suggested by the Auditor after audit.

2.10. Patch Management

The contractor shall also be responsible for providing updates/patches for the software products supplied under the project. All other patches of third party product like Operating System and Anti-virus shall be tested by the Contractor prior to installing in the Employer/Utilitys network. Other

products like IPS, Network IPS, Host based IPS, Firewalls shall also be provided with secure patch management. A secure patch management and deployment system is to be established which shall be provided with single point of Internet connectivity. All the patches shall be downloaded through this single point of connection. Internet connection shall also be provided and shall be shown in System Architecture diagram submitted during Bid submission.

Software updates and patches shall be applied while the system is in operation and shall not require a reboot (e.g. applied to one processor in a dual processor configuration). A secure (e.g. https) remote method of initiating a rollback to the software prior to the update or patch shall be provided.

SI to describe the method proposed to securely apply software updates and patches. SI to also specify the method proposed to use to securely initiate a rollback to the software state prior to an update or patch.

The Contractor shall describe a mechanism for patch management so that it is known that what patches have been applied, what all patches are pending but available with us and what is the recent release of patches for the various products as part of cyber security documentation. Any patch shall be applied only with express permission of the Employer/Utility's representative.

2.11.   Physical maintenance

The contractor shall undertake physical maintenance of all equipment/modules under the scope of this contract, in accordance with this section. The physical maintenance shall include cleaning, dusting, inspection of equipment for loose connections, damage to insulation, pest infections etc. Equipment shutdown approval for preventive maintenance shall be required from Employer/Utility.

2.12. Spares inventory

The Contractor shall maintain a spares inventory at his own cost to meet the spare availability requirements of the system. The spares shall be used as and when required and no separate charges are payable except the maintenance charges. The Contractor shall decide the items and components to be maintained as spare but a minimum number of spares as given Table below shall be kept at the respective Centers. This shall be periodically verified by the Employer/Utility. If the replenishment of the spare takes more than 30 days then it will be considered as non-availability as per Severity-2.

Table 39

S No.	Item Description	Unit	Qty.
A	Servers	Lot	1*
B	Work Station	Lot	1*
C	Routers & Switches	Lot	1*
D	Communication Equip.	Lot	1*
E	Field Devices	Lot	1*
F	Meters DCU and other Field Devices	Lot	1*

> * Note: One of each Type Supplied as part of system. Wherever one configuration can replace multiple type of elements supplied only 5% (Minimum one) such equipment shall be taken as spare

(a)   Integration of new equipment

All future Field devices & other System integration shall be the responsibility of contractor and shall be part of the maintenance charges.

(b)   Problem/Defect Reporting

The SI shall propose an appropriate problem/defect reporting procedure to   meet the requirement of all severity level cases along with the offer.

The problems will be categorized as follows:

Table 40 Severity Levels

Category	Definition
Severity1–Urgent	Complete system failure, severe system instability, loss or Failure of any major subsystem or system component such as to cause a significant adverse impact to system availability, performance, or operational capability
Severity2–Serious	Degradation of services or critical functions such as to Negatively impact system operation. Failure of any redundant system component such that the normal redundancy is lost Non-availability of Man-power at Central system during working hours, non-availability of spares
Severity3–Minor	Any other system defect, or unexpected operation not covered under severity1or2
Severity 4 – General/Technical Help	Request for information, technical configuration assistance, "how to" guidance, and enhancement requests.

2.13. Severity levels

The detail of the systems under different severity levels is as below:

   1. *Severity-1 (Urgent support)*

This support is required when there is a complete system failure, severe system instability, the loss/ failure of any major sub-system / system or its components, which may significantly impact

the system availability, performance, or operational capability at central system. For example, loss of data to the operator due to any problem software/Hardware-related in AMI/SMART GRID System, outage of any important software functionality which is required to discharge operational functions, outage of both main and standby routers, and loss of data exchange with other computer systems or other Central systems would be included under this category. The failure of complete UPS (uninterrupted Power Supply) system resulting into loss of UPS output supply at both Output ACDB is covered under this category.

Upon receiving intimation, the representative of the contractor would immediately attend to the problem. The problem shall be attended by the contractor at the earliest, and it shall arrange all resources and take all steps to restore the data availability and functionality at the earliest.

2. Severity-2

Degradation of services or critical functions such as to negatively impact system operation. Failure of one Data Server, stoppage of data collections for archiving, at the respective Central system, and outage of other applications not covered under severity-1 are included in this category.

Failure of one UPS system, Failure of Battery System and failure of any other system of Auxiliary Power supply not covered under Severity-1 are included in this category.

Coverage under this severity would be outages that do not immediately cause on line data loss but subsequently could result into Severity-1 category outage, loss of an important subsystem that may affect the day-to-day works and loss of archived data.

Failure of any redundant system component affecting the critical redundancy would also be included in this category.

Non-availability of designated contractor's Man-power at central system as well as required inventory of spares specified here will also be covered under this category.

3. Severity-3 (Standard support)

The support services included under this category are when the outage or loss of functionality is neither of an emergency nor priority functionalities as indicated in severity level 1 or 2 above.

4. Severity-4 (General Technical Help)

Request for information, technical configuration assistance, "how to" guidance, and enhancement requests are included under this category.

2.14. Response and Resolution Time

This section describes the target times within which the contractor should respond to support requests for each category of severity. The Initial Response Time is defined as the period between the initial receipt of the support request (through approved communications channels) and the acknowledgment of the contractor. The Action Resolution Time is the period between the initial response and the contractor delivering a solution. This period includes investigation time

and consideration of alternative courses of action to remedy the situation. The Action is defined as a direct solution or a workaround.

Table 41 Support Response/Resolution Time

Severity	Initial Response time(Working Hours)	Initial Response Time(Non-working hours)	Action Resolution Time	Action
1	5 minutes	30 minutes	2 hours	An urgent or emergency situation requiring continuous attention from necessary support staff until system operation is restored – may be by workaround.
2	5 minutes	2 Hours	24 Hours	Attempt to find a solution acceptable to Owner/ Employer/Utility (dependent on reproducibility), as quickly as practical.
3	2 hours	1 day	2 days	Evaluation and action plan. Resolution time is dependent on reproducibility, ability to gather data, and Owner/ Employer/Utility's prioritization. Resolution may be by workaround
4	2 hours	1 day	2 days	Report on the problem/query is to be furnished.

(c)   Availability and maintenance charges payment Calculation

It is the endeavor of both the contractor and Owner to maximize system availability to the extent possible. The contractor shall provide guaranteed availability for various types of Severity levels as specified in section above.

The non-availability hours for availability calculation shall be counted from the end of the allowed Action Resolution time. A standardized register shall be maintained at each site containing full details of each outages, actions taken by Owner to correct the problem, applicable Severity level, time of reporting to the contractor support engineer/support center pursuant to the appropriate methods in the Agreement, allowed Response time as per the Response times defined in above section, actual Resolution time, and signature of Engineer-in-charge as well as the contractor's support engineer of the site.

Duration of outages over and above the Action Resolution time in each of the Severity levels shall be counted for the non- availability computation and shall be clearly brought out in the register. The resolution may be accomplished by a work around, and such solution shall mark the end of non-availability.

In the event of multiple failures at a site, due to a common cause, the first FPR (Field Problem, Report) logged shall be used for the purpose of availability calculation.

2.15.   Availability computation for System

Availability computation shall be done on per quarter per site basis. The formula to be used for availability computation shall be as under:

Availability per quarter (per site) = $\dfrac{\text{THQ} - (S1 \times 1 + S2 \times 0.8 + S3 \times 0.5)}{100\% \text{ THQ}}$ x

Where THQ is total hours in the quarter

S1 is the total non-available hours in Severity Level-1

S2 is the total non-available hours in Severity Level-2

S3 is the total non-available hours in Severity Level -3

2.16. Payment of maintenance charges (based on AMI availability)

In the event of availability below a certain level, the maintenance charges would be proportionately reduced as follows: The same shall be applicable for the Auxiliary Power supply system with the availability specified for the respective systems.

For Software:

Availability of central system / quarter	Deduction as % of the apportioned price of total FMS (Software Portion) for central system portion of the contract applicable (quarterly software price)
>99.5%	NIL
Less than 99.5%	Deduction of 2% of the apportioned quarterly FMS charges for every 0.5% or part there of decrease in availability under 99.5%

For Hardware:

Availability for each elements per quarter	Deduction as % of the apportioned price of total FMS (Hardware portion) for central system portion of the contract applicable for that site (quarterly hardware price)
>98%	NIL
Less than 98%	Deduction of 2% of the apportioned quarterly FMS charges for every

2.17. Computation of Availability / Non-availability

The computation of Availability / Non-availability would be rounded up to 2 decimal places on quarterly basis and any deduction in the maintenance charges thereof would be calculated as stated above in aforementioned Section on pro-rata basis.

2.18. Contractor's Obligations

In order to optimize and improve the response of the system, the contractor may re-install the program modules in consultation with and after making the Owner / Employer/Utility engineer aware of the consequence (like data loss, database rebuild etc.)

Any modification of Field devices, software/Operating System required to restore functionality due to hardware upgrades, patches, or arising out of a necessity to fix FPRs (Field problem reports), would be done by the contractor at no extra cost to Owner / Employer/Utility.

The contractor will submit FSR (Field Service Report) and the steps taken to solve the problem, along with details of code changes.

2.19. Responsibilities of Owner /Employer/Utility

The responsibilities of the owner during the maintenance period are as follows:

(a)   Employer/Utility shall ensure that proper Environmental conditions are maintained for the system.

(b)   Employer/Utility shall ensure that the System is kept and operated in a proper and prudent manner as described in the system documentation provided by the Contractor and only trained Employer/Utility representatives (or persons under their supervision) are allowed to operate the system.

(c)   Employer/Utility shall provide access to the sites of installation for purposes of providing Support Services.

(d)   Employer/Utility shall provide the contractor with Space for Office for their maintenance staff and storage for spares.

2.19.1. Responsibility Matrix

The table in this section provides a summary definition of the roles and responsibilities of the contractor.

Table 42 Responsibility Matrix

Item	Task
0.0	PROBLEM IDENTIFICATION
0.1	Root cause analysis to determine whether the fault is attributable to Hardware or Software.
0.2	Resolution of problems involving third party maintainer where there is uncertainty whether the root cause is hardware or software.
1.0	SOFTWARE PROBLEM RESOLUTION

1.1	Report problem and assist with problem identification
1.2	Provide or recommend corrections, temporary patches, workarounds or other fixes to system problems
1.3	Install and test corrections, temporary patches, workarounds or other fixes to system problems
2.0	ROUTINE SOFTWARE SUPPORT
2.1	Build and maintain database, displays and reports
2.2	Perform system back-ups
2.3	Restore or reinstall software from back-ups
2.4	Monitor system logs (part of remote monitoring service)
2.5	Maintain system logs
2.6	Maintain user accounts
3.0	HARDWARE PROBLEM RESOLUTION
3.1	Report problem and assist with defining problem
3.2	Troubleshoot problem to diagnose if it is software-related or hardware-related
3.3	Identify failed component, Replace failed components in online system using parts from spares inventory
3.4	Restore operation of repaired/replaced equipment
4.0	HARDWARE SPARE PARTS
4.1	Manage local spares inventory
4.2	Provide appropriate facility for local storage of spares
4.3	Replenish local spares inventory
5.0	Integration and database work
5.1	FEP Card addition/Expansion
5.2	Database resizing

2.20. POST IMPLEMENTATION SUPPORT & WARRANTY REQUIREMENTS

The bidder shall be responsible for providing the support after go live of the system for next 3 years[1]. The scope shall include the following but not limited to the following

    a. Warranty of software which include bug fixing, patches, upgrade etc. and same shall be provided.

    b. Trouble shooting of applications

    c. Maintenance of system and application response time.

    d. System and database administration

    e. Existing Application maintenance, correction, enhancement, new development, bug fixing etc.

    f. Maintenance, modification, enhancement and new integrated business processes.

    g. Post implementation support and management shall be governed by performance parameters as mentioned in this NIT.

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[1] Initially the FMS will be for 3 years after 1 year warranty period, however FMS may be extended further for 2-3 years on same terms and conditions on mutual agreement between Utility & Vendor.

h. Post implementation shall also cover the new requirement of tools, application, reports etc. of utility.

i. The bidder shall provide the off-site support of experts also to resolve the issues in shortest time.

F. General scope of work

1. Selected bidder to establish proposed Advanced Metering Infrastructure System in Project Area i.e. operation subdivision no. 5 of CED within 12 months from the award of contract.

2. Selected bidder to provide 12 months "Warranty support" after Go-Live of project area and 36 months "Post implementation support" after the end of warranty period.

3. For the maintenance phase, selected bidder to keep the availability and reliability of the complete AMI system by at-least 99%.

4. For the maintenance phase, selected bidder to dedicatedly post at-least one (01) support engineer (Diploma in Electrical Engineering with at-least 2 years relevant experience) per circle for resolving field related matters and at-least one (01) dedicated Project – In-charge (B. Tech / B. E. in Electrical Engineering with at-least 5 years relevant experience) at the Data Centre for application management and overall system maintenance.

5. Integrating the proposed AMI system with other necessary software being implemented under this project.

6. User Acceptance Testing and Sign-Off from CED would require for declaration of Go-Live. RECPDCL will provide necessary support for coordination with CED.

7. Bidders to provide complete year wise plan for post implementation phase with deployment of resources year wise.

8. Proposed AMI Software should be scalable in nature taking into consideration an average growth rate of consumers and associated infrastructure to be 7.5 % per annum for the complete project duration from the date of award of contract to selected bidder. Enterprise-wide license for the software components is a mandatory requisite. Proposed AMI Software and associated equipment's should be capable of handling at-least 50000 connections, without any additional infrastructure and cost implication to CED.

9. The Proposed AMI solution/AMI system should have complete interoperability for accommodating all types of FRTU/MFM and communication H/W and vice-versa should also be there for any future up gradation of hardware / software.

10. Selected bidder to setup a Project Management Office, Chandigarh within 30 days from the date of award of contract. This office shall remain operational at least till the successful Go-live and User acceptance of this project. All the dedicated resources are to be deployed in Chandigarh for day-to-day coordination with Utility.

11. All supplied items must conform to the detailed technical specifications mentioned in this tender document.

12. Packaging and transportation from the manufacturer's work to the site including ports and customs clearance will be borne by the bidder.

13. The equipment shall be highly reliable providing 99% uptime and ensuring availability of the network of 99%

14. Unloading, Receipt, storage, preservation and conservation of equipment at the site.

15. The Bidder in consultation with RECPDCL Project In-charge and CED Local In-charge shall determine the exact positioning of equipment Installation, housing of equipment.

16. Insurance of all equipment from manufacturer's site till installation, commissioning, handing over and user acceptance will be borne by the bidder.

17. Maintain the mandatory and recommended (a minimum of 5%) spares during warranty and FMS period and provide the list of the same.

18. Install the equipment, obtain CED acceptance and submit a copy of the same to designated authority of RECPDCL.

19. Post completion of installation and commissioning works, the selected bidder shall provide a complete and final location table and spreadsheet indicating all locations including all the relevant following information.

20. The proposed solution must efficiently enable all required interfaces and integration, including integration with the existing software as detailed in existing IT infrastructure.

21. Provide ongoing product information and documentation such as User manuals, System administrator manuals, Technical manuals, Installation guides etc. as applicable.

22. The Bidder shall be responsible for providing all material, equipment and services specified or otherwise, which are required to fulfil the intent of ensuring operability, maintainability and the reliability of the complete work covered under this specification.

23. It is not the intent to specify all aspects of design and installation of associated systems mentioned herein. The systems, sub-systems and equipment/devices shall conform in all respect to high standards of engineering, design and workmanship, and shall be capable of performing continuous commercial operation.

24. The bidder shall make his own necessary arrangements for the following and for those not listed anywhere else:
    - Office and store.
    - Transportation.
    - Boarding & lodging arrangement for their personnel.

25. The supplier shall submit the data sheets for each of the equipment model detailing the specifications of the equipment.

26. The equipment models shall be supported by the OEM for a minimum period of next five years.

27. Technical Specifications of various type AMI equipment, Hardware & Softwares shall have full compliance with NSGM guidelines and its amendment, which is available on website www.nsgm.gov.in. However, any higher specifications are acceptable in case of any technical specification has become obsolete.

28. Software Solution:

    Software should provide following unique features:

    1. Collects, archives and analyses collected parameter from all sites.
    2. Can handle thousands of remote sites.
    3. Multiple users are able to view the data in required formats for graphs, trends, tables and reports. This enables better monitoring and control of transformers.
    4. Can be customised based on number of AMI installed and number of user clients.
    5. Each user can be assigned individual passwords and rights.
    6. Graphic user interface.
    7. View location of transformers on map
    8. Real time instantaneous parameters.

9. Log energy parameters for energy reports.
10. View all parameters and reports via web clients.
11. Trends.
12. Alarms and events
13. required log sheets
14. Required reports can be configured by the user.
15. Send alarm messages via e-mails to pre-defined users in case on events.
16. Send reports to pre-defined user at set intervals.
17. Results in saving capital equipment by early detection of expected faults.
18. Based on alarm messages received from remote DT sites.
19. Detect location of transformer faults.
20. Detect energy loss based on energy through DT and actual energy billed.

29. SYSTEM DESIGN AND ENGINEERING

i   The Bidder shall be responsible for detailed design and engineering of overall system, subsystems, elements, system facilities, equipment, services, including systems application software etc.

ii It shall include proper definition and execution of all interfaces with systems, equipment, material and services of Owner for proper and correct design, performance and operation of the project.

iii Bidder shall provide complete engineering data, drawings, reports, manuals and services offered etc. for Owner's review, approval and records

30. SPECIAL TOOLS AND ACCESSORIES

i   The bidder's proposal shall include the list of special tools, testing equipments and accessories required during development stage, for day to day operation and maintenance of the system.

ii The bidder's proposal shall include the list of special tools, testing equipment and accessories required for day to day operation and maintenance of the system. All such tools shall be supplied by the bidder. The bidder should clearly bring out the list of such tools in their technical proposal. However, the prices of these special tools shall be included in the related equipment price in the price template given in this RFP.

31. INSTALLATION & IMPLEMENTATION

i   The bidder shall be responsible for installation of all identified hardware and associated equipments at Data Centre, DR centre, Control Centre, Substations, DT locations, HT and selected LT Consumers and Communication network covered under the specification.

ii The bidder shall be responsible for provisioning of all required manpower and tools/kits for safe, reliable, proper and correct installation and providing support services for IT infrastructure created for a period of five years.

iii   The successful bidder shall be responsible for installation and configuration of software, hardware and other equipment supplied to the satisfaction of the owner. This shall include but not be limited to:
Installation of the software at Data Centre, DR Centre and various other locations, Installation of AMI equipment at Sub stations, DTs, HT and Select LT consumers.

iv   Post Go-Live, the software vendor shall provide support to fix any bug related to implementation. The entire system would be considered as successfully installed when the software will run with actual live data at site for 3 months without any bugs (Bug is lacunae in the system that prevents/ delays an operation or performs a function within the system at suboptimal level/ at performance level lesser than that specified in this specification or provides incorrect operational data or provides incorrect results in any data format in the reports generated by the users).

v   Demonstration of all the features of latest version of software; Acceptance testing of the system thus implemented to the owner's satisfaction.

32. TESTING, COMMISSION AND SUCCESSFUL OPERATION

The scope includes testing and commissioning & implementation of all equipment, sub-systems and systems of the project and putting them into successful technical & commercial operation. The scope shall include but not limited to the requirements given elsewhere in the specification. The bidder shall be responsible to provide all necessary testing and commissioning personnel, tools/kits, test equipment etc.

33. TESTING AND ACCEPTANCE PROCEDURES

Testing and quality assurance in software development is more rigorous since each component has to be more reliable, if it is to be reused. A system is tested at various stages of development and deployment. For example, each component is tested as a unit for checking the correctness of its own code. Further, the component is tested with its dependent components. After final release of the entire set of components, system is tested for the correctness of system functionality. Finally the components are further tested in simulated production load for performance and load analysis.

The Implementation Agency shall be responsible for the testing processes such as planning (includes preparing test plans and defining roles and their responsibilities), preparation (consists of preparing test specification, test environment and test data) and execution (includes testing at various levels like unit level, integration level, system level and production).

34. TEST PLAN

Test plans are prepared for each phase of testing. The initial test plan is created during the Project Planning phase. The initial test plan describes who performs which type of testing and when. Ideally master test plan covers all types of test i.e. from unit testing to production testing. The Implementation Agency is expected to submit the test plans to Utility for approval. Any changes made to the test plan during the project life cycle should be communicated to UTILITY for approval.

35. <u>TEST SCENARIOS</u>

The Selected bidder should prepare test scenario for each business scenario. A test scenario when executed should fulfill a business requirement as per the scope of business functionality. Test scenarios include following:

a) Test Specification - During the test specification phase, the test cases are specified. It consists of description of the input, process to be executed and a prediction of output results.

b) Test Environment - Component developer does unit testing and integration testing. Integration testing can be delegated to a specialized testing group. Each of the members in the testing group is provided with testing environment according to his/her role and responsibilities.

Following is sample testing environment for testing:
- A workstation
- A set of tools and applications required on workstation like access to user interface, browser etc.
- Access to centralized document database (where all the project related documents are maintained)
- Access to testing tools and defect logging tools
- Access to the central database or repository for development and unit testing (this database contains sample test data)
- Access to deployed components

c) Test Data - Test data is prepared for testing at each stage. The test data should be prepared in such a way that it covers basic path and every alternate path of the code. The basic path and alternate paths are prioritized to capture relevant data. Tools can also be used to generate test data.

36. <u>Test Execution</u>

The following testing steps are usually employed in the project lifecycle. The Implementation Agency is expected to follow these steps:

a) Unit Testing - In unit testing, each piece of code has to be rigorously tested. At this stage testing is done according to the priority of path of code. All the test results are logged in the defect logging tools. After the completion of testing, code is corrected for defect logs. This process is iterative till criteria for successful testing is reached.

b) Integration Testing - Upon completion of unit testing, integration testing begins. The purpose is to ensure distinct components of the application still work in accordance to customer requirements. Test sets will be developed with the express purpose of exercising the interfaces between the components. This activity is to be carried out by the Test Team. Integration test will be termed complete when actual results and expected results are either in line or differences are explainable/acceptable based on client input.

c) Incremental Integration Testing - Continuous testing of an application as new functionality is added.

d) System Testing - System testing is performed when all the components are delivered to central repository prior to the release of the software. The testing is done on priority basis of business processes. All the defects are logged and assigned to respective component owners. The component and unit testing is performed after the correction of code. However, it may depend on size and type of individual test specifications. Impact analysis is useful to narrow done testing efforts by identifying critical test cases affected due to code change.

e) Pre-Production Testing – Pre-Production testing is done simulating the production load. Test data is either prepared or generated from the tools. This testing is used to evaluate performance, load capacity and concurrency. Load testing tools can also be used for this purpose.

Following special types of testing are done during Pre-Production Testing Phase:

i. Regression Testing - The objective of regression testing is to ensure software remains intact. A baseline set of data and scripts will be maintained and executed to verify changes introduced during the release have not "undone" any previous code. Expected results from the baseline are compared to results of the software being regression tested. All discrepancies will be highlighted and accounted for, before testing proceeds to the next level.

ii. Performance Testing - Although performance testing is described as a part of system testing, it can be regarded as a distinct level of testing. Performance testing will verify the load, volume, and response times as defined by requirements.

iii. Load Testing - Testing an application under heavy loads, such as the testing of a web site under a range of loads to determine at what point the systems response time degrades or fails.

iv. Installation Testing - Testing full, partial, or upgrade install/uninstall processes. The installation test for a release will be conducted with the objective of demonstrating production readiness. This test is conducted after the application has been migrated to the client's site. It will encompass the inventory of configuration items (performed by the application's System Administration) and evaluation of data readiness, as well as dynamic tests focused on basic system functionality. When necessary, a sanity test will be performed following the installation testing.

v. Security/Penetration Testing - Testing how well the system protects against unauthorized internal or external access, wilful damage, etc. This type of testing may require sophisticated testing techniques:

vi. Recovery/Error Testing - Testing how well a system recovers from crashes, hardware failures, or other catastrophic problems.

f) Acceptance Testing – During the test scenarios definition, for each of the business scenario, an acceptance criterion is defined. Acceptance criteria include expected behaviour of the s/w component and the expected results (data). Expected results form a part of the Exit Criteria. In addition to expected result and behaviours, some conditions are also specified in the exit criteria. They can be:

- Number of bugs to be discovered for a functional module. This depends on size of the functionality and is an indicator of amount of testing done.
- If any medium or low-priority errors are outstanding - the implementation risk must be signed off as acceptable by Utility and Implementation Partner along with consortium partners
- All High Priority errors from System Test must be fixed and tested

Implementation Agency needs to get the acceptance criteria approved from Utility for all the functional components of the system. The Acceptance Criteria for each release into production environment will be agreed upon by Implementation Agency in consultation with Utility prior to release from Testing to production environment. After installation, if any bug is reported or there is non-compliance to requirements then a proper procedure should be followed. End-user should report ("Change Request") to his/her supervisor about the bug that will in turn get forwarded to Project Manager (PM). PM will forward the List of change request to Implementation Partner along with consortium partners. After the bug is fixed, it should be reflected in the production copy after testing it.

g) Performance Testing - The bidder has to test and demonstrate the operational performance requirement as defined in the clause 9 of the specification after completion of entire scope.

This will be part of acceptance testing. The system will be taken over by owner only after successful operational performance testing. The bidder has to arrange necessary hardware / software to demonstrate the performance testing.

Bidder should note that RECPDCL/CED can appoint a third party agency for conducting any part of above testing procedures (in addition to the testing carried out by the bidder).

37. INTEGRATION SCOPE

All required external systems shall be integrated on a continuous basis using an integration middleware layer. The integration is expected to be on on-line real time basis or batch mode where appropriate and shall operate in an automated fashion without manual intervention.

The scope of external integration will be, but not limited to:
- Integration with other Smart Grid Applications, which are being implemented.
- The integration may use a continuous integration middleware layer as specified by the vendor. This integration middleware layer could then be used to undertake any future integration between applications. The integration middleware shall be based on Service Oriented Architecture (SOA) and shall use publish / subscribe mechanism. Purchaser does not want to build and maintain point to point integration.

- The integration middleware shall be open architecture based.
- Data to be integrated must be validated by the developed interfaces.
- The data to be integrated will be mapped, transformed (if required) and reconciled automatically.
- All interfaces are to be self-checking so that any exceptions or data validation errors are reported by the system. In addition, integration logs should be maintained that confirm the success or otherwise of the interface, complete with control totals.
- The mapping should be manageable through a GUI based administrative interface

38. TRAINING FOR THE EMPLOYEES -

The vendor shall be required to organize following training for the owner's personnel.

The bidder shall provide training to various user groups as nominated by CED, RECPDCL . The bidder shall provide the Training Approach in the response. The training modules shall include but not limited to –

- AMI Administration & Configuration
- AMI/AMI Installation and Trouble-Shooting
- Application Management
- Application Data Analysis

Training arrangements – All trainings must be of minimum 1 day or bidder can propose more no. of days training along with batch size as per requirement. A training calendar with contents and sessions will be also agreed upon between bidder and RECPDCL/CED. The selected bidder shall be required to organize following training for the CED/RECPDCL personnel: -

Professional Training - This is the training for the core Group of implementation team of the CED and RECPDCL/CED. This team will comprise of members from all the Business Functions and IT sections.
Each member would be trained in the relevant function / module. This Training would be required to be given to approximately 20-25 personnel. It is the responsibility of implementation agency to deliver this training. Standard curriculum, designed and agreed by the owner for hardware, software and network preferably from the OEM partner or OEM's certified training partner shall be arranged for each group. The vendor is required to quote on per person basis for this training. The Purchaser will prefer if a portion of the training is conducted on-site.

End User Training - The bidder will provide training to the owner's team on a "Train the Trainer" basis. The Owner's team so trained will then train all of the owner's end users. It is estimated that this training will require around 8 groups, with each group comprising of around 12 to 15 persons. These training sessions will be required to be conducted at any of the sites.

The recommended training material can be in paper / electronic media with courses on BPA software fundamentals, business process overview, job activity training, and delivery options being on-line, CBTs, instructor led class rooms, etc.
During the course of the implementation, the bidder is expected to complete / be involved in the following activities in terms of skill transfer:

- Testing scripts should be prepared to test the business processes and scenarios of the new system.

- The project team members will further develop these testing scripts into training documents.
- Training material will be organized by functional process that will serve as the training documentation for a particular functional area.
- Assist the Owner's team members in creating procedure documents for use in conjunction with the other training material. A procedure document will list all of the transactions necessary to complete a business scenario whereas a training document lists the steps to execute a transaction. Each step will be a transaction referenced in a training document.
- Procedures will be listed for all the online steps needed to complete a scenario.
- In addition to functional training document binders and procedures, the project team members will create training courses and exercises. The training courses will contain all the training documents and necessary to train an end-user in his / her role. The training exercises will list common business scenarios and input data that the user will enter to practice with the newly developed BPA software.
- Vendor will assist in administering training to project team members and / or power users, to "train the trainers".
- Vendor should assist in administering training to the rest of the users / peers in functional areas based on the course documentation developed by the project team and vendor.

The training will consist of a curriculum of courses to address the issues of system operation, business-wide application, changed business processes and general use of the new system.

Representatives from the successful vendor, Purchaser's implementation project and change management teams will be involved throughout in the development of training strategy, training material design and development, standards and training delivery to ensure that change management issues are incorporated, and that training strategies and materials are aligned to the requirements of the project and as business-specific as possible.

The roll out of the training program will be coordinated with the overall project implementation strategy.

39. SUPPLY OF MEDIA -

The successful bidder shall supply two copies of media of AMI applications and its related software's solution against the specifications.

40. DOCUMENTATION SCOPE –

The following documents (one set each) will be required for smooth functioning of the system. The successful vendor will provide ongoing product information for referential purposes and facilitating self-education by CED/RECPDCL personnel. Key aspects shall include:

What documentation is included in the standard license fee, for example:

- User Manuals
- System Administrator Manuals
- Technical Manuals
- Installation Guides
- Business Process Guides
- Program Flow Descriptions

- Sample Reports
- Screen Formats
- Toolkit Guides
- Troubleshooting Guides
- Frequently Asked Question (FAQ) Guides

The clarity, comprehensiveness and accuracy of the documentation (an example document should be made available):

- The media upon which documentation is made available.
- The frequency of documentation updates and distribution mechanism of the updates.
- The ability for documentation to be customized for or by RECPDCL/CED

Hard copy and soft copy of user manuals are expected to be provided by the successful vendor. These should include information on the application concepts in addition to transaction and field level documentation. Additionally, the Technical Users Information manual provides information on the BPA software's table structures.

Selected Bidder will be expected to assist in developing operational procedure manuals. If the user manuals are provided in Word format, the client should have the ability to customize their own manual to include specific business processes or operational procedures.

Selected Bidder can also be required to provide context sensitive on-line help, which includes all materials provided in the hard copy manuals. Where possible, users should be able to add their own on-line help documentation.

41. TIMELINES FOR DELIVERY AND IMPLEMENTATION

The bidder is expected to complete the Enterprise Wide - implementation of AMI system on all connections within 12 months from the date of award of contract by the RECPDCL.

Bidder shall submit a detail Gantt chart along with the following implementation schedule. Bidders shall drill down these activities into sub/sub-sub activity in the chart. The chart shall also detail out time and resource effort required to execute each activity. The detailed bar charts for all the work activity shall however, be discussed and agreed to by the successful Bidder with the owner before start of the execution of work. However, provided that the detailed bar chart shall not fall short of the scope of work provided under the NIT and in the event of agreed scope of work is reduced by virtue of the bar chart, the same is subject to written approval of RECPDCL and will attract proportionate reduction in total cost along with other charges.

Table 43 Timelines for Delivery & Implementation

| Sr. No | Activity Name | Start Date | Weekly Plan | | | | | | End Date |
			W1	W2	W3	W4	W5	…..	
1	Resource Mobilization and establishment of site office								

2	System Design and approval from Owner											
3	Proof of concept of the Overall Solution											
4	Establishment of AMI System											
5	Roll Out in Project Area											
6	Warranty Services (12 months)											
7	FMS Services (36 months)											

G. PAYMENT SCHEDULE

The payment terms for AMI system establishment and related services milestones in sequence are given below:

Table 44: PAYMENT SCHEDULE

S. No.	Milestone	Payment
1	Upon receipt of unconditional acceptance of LOA, and unconditional & irrevocable Bank Guarantees with a validity period upto 5.5 years from the date of LOA date in favor of RECPDCL amounting to 110% of total advance amount and receipt of unconditional & irrevocable Performance Bank Guarantee (PBG) as per Annexure-A for ten percent (10%) of the total Contract price towards Contract Performance with a validity till completion of 5 years 6 months period from the date of award of LoA.	Interest bearing 10% advance of Contract Price which will be prorata adjusted in each installment (from S. no.2 to 6) (The annual interest rate shall be calculated based on SBI MCLR +2% as applicable from time to time.)
2	After Sign off of SRS, design document and Data model and Factory Acceptance test (FAT) and Delivery of 30,000 Smart Meters along with related Hardware, Softwares and equipments at Project site (Payment will be made on Prorata basis considering six lots of 5,000 each.)	60% of Contract Price**
3	Installation, commissioning and integration of all AMI Hardware, Software, field material in Project Area and Site Acceptance test (SAT). (Payment will be made on Prorata basis considering six lots of 5,000 each.)	10% of Contract Price**
4	Completion of minimum 3 billing cycles (monthly) with at-least 98% (on daily basis) AMI system performance and User Acceptance by utility.	10% of Contract Price**
5	Successful completion of all responsibilities and obligations and handing over of system to Utility	15% of Contract Price**
6	Completion of 1 year warranty + 3 years FMS period. The payment may be released earlier provided the supplier submits the Bank Guarantee (BG) for an amount equivalent to 5% of contract value. This BG shall remain in force up to and including 6 months after FMS period.	5% of Contract Price**
7	Charges towards FMS during FMS period of 3 years after 1 year warranty period.	On Quarterly basis at the end of quarter on satisfactory completion of Facility Management Services.(FMS price will be divided by 12 quarters).

*** Price is sum total of all-inclusive cost for software, hardware supply and implementation and other related services.*

Payment procedure:

Method of payment: All invoices/claims shall be raised by the bidder in the name of Chandigarh Electricity Department (CED), Chandigarh (owner) C/O RECPDCL. All the payment shall be released directly to the bidder by RECPDCL within 30 days of submission of invoices after receipt of funds from CED. Further tax will be deducted as per applicable law from the payment made on behalf of CED.

The completion time of the project shall be monitored as per milestones mentioned above. Any delay in compliance to the milestone timelines shall lead to Penalty, and shall be deducted from the payments due under the Contract or by invoking the Contract Performance Bank Guarantee and/or otherwise, as per the following Penalty table–

Table 45: Penalty Terms

Milestone	Timelines	% age penalty on Price
On installation, commissioning and integration of all AMI Hardware, Software, field material in all Project Area, completion of trainings and user acceptance by RECPDCL and CED Project In-charge.	Within 12 months	Not Applicable
	Beyond 12 months	0.5% of Contract Value (excluding Post Implementation phase Value) per week or part-thereof with maximum 5% of the contract value may be levied from the bill of the contractor.

SECTION-V

SPECIAL CONDITIONS OF CONTRACT

1. The bidder must fulfil the above eligibility criteria/pre-qualifying conditions for evaluation of their bids. Bids of bidders should be strictly in manner and mode prescribed hereunder and fulfilling the above eligibility/pre-qualifying conditions will only be evaluated by the duly constituted evaluation committee. Bids of the bidders not being submitted in the manner and mode required hereunder and/or not fulfilling the eligibility/pre-qualifying conditions given above may be summarily rejected at the sole discretion of RECPDCL. Undertaking for subsequent submission of any of the above documents will not be entertained under any circumstances.

2. RECPDCL reserves the right to conduct the reverse auction (if required) for the products/ services being asked in the tender. The terms and conditions for such reverse auction event shall be as per the Acceptance Form attached as Annexure - B of this document. The bidders shall mandatorily submit a duly signed copy of the Acceptance Form along with the tender document as a token of acceptance.

3. RECPDCL reserves the right to verify/confirm all original documents/documentary evidence against the documents/bid submitted by the bidder in support of above mentioned clauses of eligibility criteria, failure to produce the same within the period as and when required and notified in writing by RECPDCL shall result in summarily rejection of the bid.

4. RECPDCL reserves the right to accept or reject any or all bids/tender without assigning any reason.

5. Acceptance of the application(s) constitutes no form of commitment on the part of RECPDCL. Furthermore, this acceptance of the application confers neither the right nor an expectation on any application to participate in the proposed project.

6. RECPDCL reserve the right to waive off any shortfalls; accept the whole, accept part of or reject any or all responses to the Tender.

7. RECPDCL reserve the right to modify, expand, restrict, scrap, and re-float the tender without assigning any reason for the same.

8. The responder shall bear all costs associated with the preparation and submission of its response, and RECPDCL will in no case be responsible or liable for these costs, regardless of the conduct or the outcome of the tender process.

9. Consortium and joint venture responses will be acceptable given that the members of the consortium/joint ventures individually and independently meet the eligibility criteria provided hereunder or as may be prescribed by RECPDCL from time to time by corrigendum/supplemental to this NIT.

10. RECPDCL reserves the right to increase or decrease the RC quantity (on same rate and terms and conditions) by another ± 20% if required.

11. For all equipment, the bidder shall provide warranty for a period of 12 months from the date of commissioning. After the completion of warranty period, the bidder shall provide 3 years[2] Facility Management Services (FMS) support for all supplied, installed and commissioned equipment.

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[2] Initially the FMS will be for 3 years after 1 year warranty period, however FMS may be extended further for 2-3 years on same terms and conditions on mutual agreement between Utility & Vendor.

12. Performance Security: The agency need to deposit within fifteen (15) working days from the date of acceptance of work order, a Performance Security in the form of Bank Guarantee or Demand Draft (DD), for an amount of 10% (Ten per cent) of the Tender value for the due performance and fulfilment of the contract which is valid for 66 months from the date of award of LoA in the format placed at Annexure – A.

   a   The Performance Bank Guarantee may be drawn from a scheduled commercial bank in favour of "REC Power Distribution Company Ltd", New Delhi.

   b   The Performance Bank Guarantee may be discharged/ returned by the RECPDCL after the completion of the contract upon being satisfied for the performance of your obligations under the contract.

   c   Failing to comply with the above requirement, or failure to enter into contract agreement within 30 days or within such other extended period, as may be decided by the CEO, RECPDCL shall constitute sufficient grounds, among others, if any, for the annulment of the award of the tender.

   d   In the event you are unable to provide the services, during the engagement period as per the contract for whatever reason, the Performance Bank Guarantee would be invoked by RECPDCL.

   e   No Bank Charges/ interest shall be payable for the Performance Bank Guarantee.

13. Rates and Prices

   a   Bidders should quote item-wise rates/ prices including all taxes and duties/GST as mentioned in Form-III by explicitly mentioning the breakup of basic prices and applicable taxes/GST.

   b   Price quoted by bidder shall be firm for entire contract period.

   c   Price quoted shall be firm and any variation in rates, prices or terms during validity of the offer shall lead to forfeiture of the EMD of said bidder.

   d   The quoted prices shall be for delivery and installation at Chandigarh. The prices shall be FOR destination and shall include all charges, levies and duties for delivery and installation at the specified locations in Chandigarh UT. The exact details of location address etc. shall be provided along with the release order.

14. In case of default in services or denial of services, RECPDCL, at its sole discretion, will be free to avail services of other service providers at "Risk & Cost" of the bidder.

15. All other terms and conditions of the GENERAL CONDITIONS OF CONTRACT shall be applicable.

16. All the licenses shall be procured in the name of "Chandigarh Electricity Department"

17. The source code of the customized part of the application software will remain the exclusive property of the CED, even after the termination or expiry of the contract. The ownership shall also remain with the CED in case the selected vendor fails to execute tasks to the satisfaction of the CED.

18. The proposed solution should have the provision for integration with near future systems like Customer care and Billing System, SCADA, OMS, DMS, GIS etc. Bidder would be sole responsible for providing the necessary touch points in required technology for integrating future solutions with proposed systems during the complete contract period.

19. Bidder to ensure proper sizing of servers, storage and network bandwidth as per project requirement. Any additional requirement to ensure the desired performance to be fulfilled by bidder as part of their scope.

20. The bidder shall provide enterprise wide license without constraint of number of CPU / Core / Number of Users / Number of Consumers for AMI Software. However, licensing requirement is indicative only for computation of immediate requirement but not limiting the requirement of Enterprise Wide License in any way.

21. The RECPDCL/CED shall be at liberty to deploy the solution anywhere within the Chandigarh UT and at any other location (Outside Chandigarh).

22. All Post implementation support period shall start from the date of sign-off of Go Live of complete project area.

23. Sub-contracting of the work is not permitted. In case of minor or field work, sub-contracting may be permitted with prior written approval of RECPDCL.

24. INTEGRITY PACT (Form-VIII):-The bidders have to submit integrity pact as per prescribed format on a non-judicial stamp paper of Rs. 100/- in 2 copies duly signed by the person signing the bid. The bidder shall not change the contents of "Integrity Pact".

25. In this tender either the Indian agent on behalf of the Principle /OEM or Principle / OEM itself can bid but both cannot bid simultaneously for the same item/product.

26. If an agent submits bid on behalf of the principal /OEM, the same agent shall not submit a bid on behalf of another principal /OEM in the same tender for the same item/product.

27. REC Procurement Guidelines shall be followed, wherever not specifically mentioned in the tender.

28. Timely completion is the essence of the scope of work of this NIT. In the event of failure to supply, implement, maintain with respect to all or any part of the Scope of Work within the stipulated time period or any deficiency in performance of the works under the Scope of Work, the Owner/Employer/Purchaser is entitled to charge and recover a liquidated damages at an applicable rate from the selected Bidder.

For the Supply: as liquidated damages a sum equal to 1% of the price of any material/store/services not delivered or total value in case where part delivery is of no use, per week or part of week subject to maximum of 10% of total order for supply.

For Works: as liquidated damages equal to 0.5% of the contract value per week or part thereof subject to maximum of 5% of the contract value for works in case the works are not completed within the stipulated time.

For Services: as liquidated damages equal to 0.5% of the contract value per week or part thereof subject to maximum of 5% of the contract value for services, in case the services are not completed within the specified time period or are unsatisfactory.

Liquidated Damages can be recovered from any pending dues of the selected Bidder, however, in case no dues are pending the same shall be recovered by invoking the Performance Bank Guarantees.

SECTION-VI

ELIGIBILITY CRITERIA

Pre-Qualifying Criteria for Bidder

QUALIFYING REQUIREMENT				
S No	Particulars	QR/Definitions		
1	Definition	- Bidder The bidder can be an individual organization or a joint venture or a consortium of maximum three (3) organizations meeting the QR. It should be defined in the consortium agreement, the name of lead bidder and roles and responsibility of each consortium members, however, primary responsibility of project delivery will be of lead bidder. - Lead Bidder One of the consortium members primarily responsible for performing all the responsibilities defined in the contract shall be designated Lead Bidder. Evidence of this authorization shall be provided by submitting a power of attorney signed by legally authorized signatories of all consortium members along with the bid. Bidder to furnish details as per Annexure D. - Document Indexing Bidder will submit an Index of documents submitted with this bid mentioning following details. This index will be used to locate the document easily and correlating correct document with correct QR.		

S.No.	QR clause and page number as per NIT	Title of document submitted against each QR	Relevant page number in document.	Relevant clause no. in document.
1				

➤ Qualifying criteria for Bidders as mentioned in Clause A in table below should be met individually in case bidder participating individually or collectively in case of bidder(s) participating as consortium.

➤ And qualifying criteria in respect of AMI Software (HES/MDM) as per Table B below, OEM for Meter Manufacturer as per Table C & Network Bandwidth service provide as per table D should be met by respective bidder/OEM/Consortium partner individually.

A. QR for Bidder (Any OEM or System Integrator)					
Sr. No.	Description	Qualification Criteria	Evaluation/Documents Required	Submitted (Yes/No)	Page number in Index document
1	Company/ Firm Registration	Bidder should be a company incorporated under Companies Act, 1956 or 2013 including any amendment thereto. In case, bidder is a Consortium / Joint Venture of three (max) companies, all members of the Consortium/JV should be registered company in India under Companies Act, 1956 or 2013 including any amendment thereto.	Certificate of Incorporation issued under Companies Act, 1956 or 2013 including any amendment thereto from Registrar of Companies to be submitted.	Yes/No	
2	Quality Certification	The Bidder should be an ISO 9001:2008/ISO 9001:2015 certified. OR Bidder should have CMMI Level 3 (minimum) certification.	A valid ISO/CMMI certificate valid on the previous date of original bid-submission of the tender.		
3	Financial Strength	The average annual turnover of the bidder shall be a minimum of ₹ 17.10 Crores during the last 3 years ending 31st March of the previous financial year (i.e. till 2016-17).	CA certified Audited Balance Sheet and P&L Account for the last 3 years ending 31st March, 2017.		
4	Workforce Capability	The Bidder should have at least 5 personnel on its rolls with a minimum AMR/AMI implementation experience of 02 years (either in his/her own or other organization). The roles & responsibilities of the personnel should include development and/or customization of AMR/AMI System.	Details of Manpower as per CV format (Form VI) provided with this tender duly Signed resume of employees need to be submitted counter signed by Authorized signatory submitting the tender.		
5	OEM	The bidder/lead bidder should be	Authorization		

	Authorization	an authorized implementation partner of OEM products [Smart Meters, AMI (HES/MDM) Software Application, Network Bandwidth (including RF)] in the bid and should possess all the necessary authorizations of the OEM in order to supply, customize, implement and support their OEM solutions.	letter from OEM of Smart Meters, AMI (HES/MDM) Software Application, Network Bandwidth (including RF), for next 5 years back to back support of as per the format attached for Manufacturer's Authorization form (MAF) valid on the previous date of original bid-submission of the tender.		
6	Experience	The bidder must have successfully executed & implemented AMR/AMI projects (meeting any of the below criteria) in an Indian/Global Power Distribution Utility during last 7 years ending last day of the month previous to the one in which bids are invited should be either of the following:- a. Successfully executed 01 AMI/AMR project covering implementation of AMI/AMR Meters along with RF module / modem, HES/MDMS/MDAS, RF Mesh/GPRS/3G/4G services of Value Rs. 19.51 Crores or for 24000 meters. OR b. Successfully executed 02 AMI/AMR project each covering implementation of AMI/AMR Meters along with RF module / modem, HES/MDMS/MDAS, RF Mesh/ GPRS/3G/4G services of value Rs. 12.19 Crores or for 15000	Individual Client's LOA / PO / WO along with completion certificate issued by client/complete payment reflecting completion of work/ return of PBG after completion of work during last 7 years ending last day of month previous to the one in which bids are invited.		

		meters. OR c. Successfully executed 03 AMI/AMR project each covering implementation of AMI/AMR Meters along with RF module / modem, HES/MDMS/MDAS, RF Mesh/ GPRS/3G/4G services of value Rs. 9.75 Crores or for 12000 meters.			
7	Experience in AMI Implementation	To establish the experience of Smart Meters / AMI Systems, bidder must have implemented / implementing at least 1000 Nos. of Smart Meters having single & three phase Smart Metering System in an Indian/Global Power Distribution Utility during last 7 years ending last day of month previous to the one in which bids are invited.	Individual Client's LOA / PO / WO/ completion certificate issued by respective clients along with details as per attached format [FORMAT – AMI DETAILS (Self-certified)] as proof, during last 7 years ending last day of month previous to the one in which bids are invited.		Attach separately as per below format.

FORMAT – AMI DETAILS (Self-certified)

S. No	Work order Number & date (Consider PO which have Smart meters)	Work Start & Completion date (If currently ongoing then mention)	No. of Smart Meters with make and model number	Communication system with major component make & model	Software /MDM module OEM & version	Name of system integrator, and make of utility legacy solution / consumer care & Billing system	Project location, Client Name, Contact person number & email	Reference bid document name, page number
1								
2								
3								

B. QR for AMI Software(HES, MDM) Provider					
Sr. No.	Description	Qualification Criteria	Evaluation/Documents Required	Submitted (Yes/No)	Page number in Index document
1	Quality Certification	The OEM shall have ISO 9001:2008 certifications. Or Shall have CMMI Level 3 (minimum) certification.	A valid ISO/CMMI certificate on the previous date of original bid-submission of the tender.		
2	Financial Strength	The average annual turnover of the bidder shall be a minimum of ₹ 17.10 Crores during the last 3 years ending 31st March of the previous financial year (i.e. till 2016-17).	CA certified Audited Balance Sheet and P&L Account for the last 3 years ending 31st March, 2017.		
3	Experience	AMI software provider should have successfully executed during last 7 years ending last day of month previous to the one in which bids are invited should be either of the following: a. Successfully executed one AMI/AMR projects involving with AMI Software application of 24000 meter or of Value Rs. 19.51 Crores. OR b. Successfully executed Two AMI/AMR projects each involving with AMI Software application of 15000 meter or of Value Rs. 12.19 Crores OR c. Successfully executed Three AMI/AMR projects each involving with AMI Software application of 12000 meter or of Value Rs. 9.75 Crores.	Individual Client's LOA / PO / WO along with completion certificate issued by client/complete payment reflecting completion of work/ return of PBG after completion of work during last 7 years ending last day of month previous to the one in which bids are invited.		
4	Support Centre	Service center should be located in India, however bidder has to adhere with the timelines to provide response and resolution as per SLA.	Self-Certify by OEM on letterhead the list of service centers across India.		

C. QR for Meter Manufacturer (Meter OEM including Smart meter OEM)					
Sr. No.	Description	Qualification Criteria	Evaluation/Documents Required	Submitted (Yes/No)	Page number in Index document
1	Quality Certification	The OEM shall have ISO 9001:2008/ISO 9001:2015 and ISO 14001 or latest certification.	A valid ISO certificate on the previous date of original bid-submission of the tender.		
		OEM should have in-house NABL accredited Laboratory as on the previous date of original bid-submission of the tender.	A valid NABL registration certificate mentioning issue / renewal / expiry date as on the previous date of original bid-submission of the tender.		
2	Financial Strength	The average annual turnover of the bidder shall be a minimum of ₹ 17.10 Crores during the last 3 years ending 31st March of the previous financial year (i.e. till 2016-17).	CA certified Audited Balance Sheet and P&L Account for the last 3 years ending 31st March, 2017.		
3	Experience	OEM should have successfully executed during last 7 years ending last day of month previous to the one in which bids are invited , either of the following: a. Successfully manufactured and supplied for One Project/Work order of Smart meters/AMR meters along with RF/GPRS/3G/ 4G/modems (external/in-built) of Value Rs. 19.51 Crores or of 24000 meters . OR b. Successfully manufactured and supplied for two projects/ work order each of Smart meters/AMR meters along with RF/GPRS/3G/4G/modems (external/in-built) of Value Rs. 12.19 Crores or of 15000	Individual Client's LOA / PO / WO along with completion certificate issued by client/complete payment reflecting completion of work/ return of PBG after completion of work during last 7 years ending last day of month previous to the one in which bids are invited.		

		meters OR c. Successfully manufactured and supplied for three projects/ work order each of Smart meters/AMR meters along with RF/GPRS/3G/4G/modems (external/in-built) of Value Rs. 9.75 Crores or of 12000 meters			
4	Support Centre	Service center should be located in India, however bidder has to adhere with the timelines to provide response and resolution as per SLA.	Self-Certify by OEM on letterhead the list of service centers across India.		
5	Nature of Firm of Meter Manufacturer	OEM should have meter manufacturing facility in India and manufacturing of meters/smart meters as per latest applicable BIS standard.	BIS-certificate valid on the previous date of original bid-submission of the tender and India works address & contact details		

D. QR for Network Bandwidth Service Provider					
Sr. No.	Description	Qualification Criteria	Evaluation/Documents Required	Submitted (Yes/No)	Page number in Index document
1	Company Business	The network solution provider should have been in the network installation / maintenance services business for the last 3 years. (i.e. Year 2014-15, 15-16, 16-17)	Valid Certificate of Incorporation and Registration certificate.		
2	Quality	The NBSP shall have ISO 9001:2008 or latest certifications.	ISO certificate copy valid on the previous date of original bid-submission of the tender.		
3	Financial Strength	The average annual turnover of the bidder shall be a minimum of ₹ 17.10 Crores during the last 3 years ending 31st March of the previous financial year (i.e. till 2016-17).	CA certified Audited Balance Sheet and P&L Account for the last 3 years ending 31st March, 2017.		
4	Work Experience	The network solution provider should have successfully implemented during last 7 years ending last day of month previous to the one in which bids are invited , either of the following: a. Single multi-location WAN Projects (installation, integration, maintenance & management) involving GPRS, 3G, 4G, Leased Lines, ISDN, VSAT, RF, DSL, VPN /MPLS or Fiber Optic or a combination of these technologies for a customer having a minimum of 10 WAN locations of value Rs.19.51 Crores. OR Two multi-location WAN Projects (installation, integration, maintenance & management) each, involving GPRS, 3G, 4G,	Individual Client's LOA / PO / WO along with completion certificate issued by respective clients during last 7 years ending last day of month previous to the one in which bids are invited.		

		Leased Lines, ISDN, VSAT, RF, DSL, VPN /MPLS or Fiber Optic or a combination of these technologies for a customer having a minimum of 10 WAN locations, of value Rs.12.19 Crores. OR Three multi-location WAN Projects (installation, integration, maintenance & management) each, involving GPRS, 3G, 4G, Leased Lines, ISDN, VSAT, RF, DSL, VPN /MPLS or Fiber Optic or a combination of these technologies for a customer having a minimum of 10 WAN locations, of value Rs.9.75 Crores			
5	Network Feasibility of Project Area	The Network Solution provider should have the necessary network infrastructure and good quality network coverage in project area.	Self-certify that bidder has done feasibility of project area and he can provide quality coverage.		
6	Support Centre	Service center should be located in India, however bidder has to adhere with the timelines to provide response and resolution as per SLA.	Self-Certify by OEM on letterhead the list of service centres across India.		
7	Workforce	The Network Solution Provider should have at least 5 personnel on its payroll with a minimum experience of 2 years. The roles & responsibilities of the personnel should include installation or integration or maintenance or management of network systems.	Signed resume of employees need to be submitted. Scanned signatures shall be accepted		

Mandatory Technical Compliance Bidder

The Bidder should ensure the following Mandatory Technical Compliance during design and Engineering of AMI Systems and submit the duly signed document along with the bid:

Table 46: Mandatory Technical Compliance

S. No.	Solution Specifications
A.1	The solution shall be designed with Service Oriented Architecture. The solution shall be designed based on Component-based approach. It shall be highly granular and loosely coupled to ensure that the failure of one component does not cascade to others.
A.2	The solution shall be designed on web based architecture.
A.3	The solution shall be horizontally and vertically scalable and also have virtualization capability.
A.4	The solution shall be designed with Open Industry Standards and not with Supplier's proprietary protocol.
A.5	The directory services shall be based on commonly accepted application protocol like LDAP.
A.6	The proposed solution should be based on WS-* specifications (Web services specifications) & unified access framework compliant to W3C (World Wide Web Consortium) specifications.
A.7	The application shall provide the functionality to configure the parameters to define the business rules with the application. These parameters shall not be hard-coded in the application.
A.8	The solution shall provide the functionality to configure the roles & responsibilities and grant role based access to the users. Also, the system shall have the capability to integrate with various standard SSO (Single Sign-On) or IDM (Identity Management) applications.
A.9	The solution shall use an integration middleware layer so that all required external systems shall be integrated on a continuous basis.
A.10	The solution shall provide the functionality to encrypt the data stored or transmitted data.
A.11	The solution shall provide the functionality to maintain the audit trail of all critical transactions.
A.12	The solution shall be able to interoperate with: • standard RDBMS platforms like Oracle, MS SQL, MY SQL, DB2, Informix, Sybaseor any other RDBMS confirming to ANSI/ISO SQL-200n standards • Operating systems like Windows, UNIX, and Solaris etc. • web browsers like Internet explorer, Mozilla Firefox, Opera etc.
A.13	The solution shall be installed with the latest security updates provided by software Supplier.

S. No.	Solution Specifications
A.14	The software version shall be supported by the software vendor for a minimum period of next five years.
A1	Module: AMI
A1.1	The AMI Solution shall be capable of collecting and analyzing data on a common data structure/ format from system/ consumer meters of various makes and models. The solution shall be compatible with present Modbus compliant meters installed in utilities as well as future meters likely to be introduced in Indian market complying with MODBUS/DLMS /COSEM/IEC-62056/ANSI C-12.19/IEEE P-1377 Standards.
A1.2	The regional hierarchy and network topology shall be specific to the Indian context and flexible enough to account for different voltage levels in Indian sub-transmission and distribution networks e.g. 66/33/22/11/ 0.4 KV.

SECTION-VII

TENDER EVALUATION METHODOLOGY

OPENING OF BID:

The Bidder or his authorized representative may be present at the time of opening of bid on the specified date, but a letter in the form annexed at (Form – I) hereto must be forwarded to this office along with bid and a copy of this letter must be produced in the office by the person attending the opening of bid. Unless he presents this letter, he may not be allowed to attend the opening of bid.

In case of unscheduled holiday on the closing/opening day of bid, the next working day will be treated as scheduled prescribed day of closing/opening of bid; the time notified remaining the same.

1. EVALUATION OF BID:

TECHNICAL EVALUATION: The Technical evaluation shall be carried out in the following two stage process:

Stage-I Pre-Qualifying Criteria

Evaluation and comparison of bids will be done as per provisions of Pre-Qualifying Criteria and based on supporting documents provided online during the e-bidding process as proof of pre-qualifying criteria at Section – VI. RECPDCL reserves the right to verify the site of operation for above activity and list of persons provided as per qualifying criteria and accordingly decide upon meeting the requirement.

The RECPDCL will examine the bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed and whether the bids are generally in order qualifying to which bids shall be summarily rejected.

Stage-II Technical Marks Evaluation:

The bidders who meet the pre-qualification criteria as per Stage –I evaluation shall be considered for Stage-II Evaluation process. During Stage-II, marks shall be awarded to bidders based on their credentials submitted as per the Table 47 below. RECPDCL shall not disclose the Technical marks awarded to the bidders at any stage. RECPDCL reserves the right for consideration of documents submitted by bidders for marking at its sole discretion.

The bidders obtaining minimum 75 marks in Stage-II Technical marks evaluation shall be considered as Technically Qualified for financial bid opening. The financial bids shall be opened only for the technically qualified bidders. RECPDCL shall disclose the name of the Technically Qualified Bidders only, before opening of Financial Bid.

Table 47: Technical Marks Evaluation

Sr. No	Particulars	Requirement	Units	Criteria	Score	Max Marks	Self assessed Marks & Supporting Documents
1	Lead Bidder/OEM /AMI Software provider Financial Strength	The minimum average annual turnover of the bidder shall be a minimum of ₹ 17.10 Crores during the last 3 years ending 31st Mar, 2017 of the previous financial year.	MAAT	>100 Crores	10	10	
				>30 Crs and =< 100 Crs	8		
				> 25 Crores and =<30 crores	6		
				>17.10 Crores and =<25 Crores	4		
2	Proposed MDM Experience of MDM Provider	MDM global presence in last 5 years in terms of number of consumers in power, gas and water sector	No. of Consumers	> 500 K	10	10	
				>100 K and =< 500 K	8		
				>= 10 K and =< 100 K	6		
3	Man-power Experience	The Bidder should have at least 5 personnel on its rolls with a minimum AMR/AMI implementation experience of 2 years (either in his/her own or other organization). The roles & responsibilities of the personnel should include development and/or customization of AMR/AMI System.	No. of Persons	>10	5	5	
				> 5 and =<10	4		
				=5	3		
		Experience of proposed Project Manager (with B.E. / B.Tech degree or equivalent) in power distribution / transmission sector.	Years of professional Experience after	> 10 Years	5	5	
				> 7 Years to = <10 Years	4		
				>= 5 Years to =<7 Years	3		

			B.E./B. Tech				
4	Experience	The Bidder must have successfully executed & implemented AMR/AMI projects in an Indian/Global Power Distribution Utility during last 7 years ending last day of month previous to the one in which bids are invited, covering implementation of minimum 12,000 nos. of Meters with required hardware, software and other associated accessories	No. of Projects	Total project completed cumulatively with >= 45000 meters installation during last 7 years ending last day of month previous to the one in which bids are invited (however at-least one project should cover installation of at-least 24000 meters)	30	30	
				Total project completed cumulatively with >=35000 and < 45000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited (however at-least one project should cover installation of at-least 24000 meters)	25		
				01 No. of project completed with > =24,000 and < 35000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited	20		
				02 Nos. of projects completed, with >=15,000 and < 24000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited	15		

				03 Nos. of projects completed, with >=12,000 and < 15000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited.	10		
5	Experience in Smart Grids implementation	To establish the experience of Smart Meters / AMI Systems, bidder must have implemented / implementing at least 1000 Nos. of Smart Meters having single & three phase Smart Metering System.	No. of Smart/ AMI Meters	>= 50,000	10	10	
				>= 1000 and < 50,000	7		
				= 1000 Nos.	5		
6	Experience in Indian Power Distribution Utility	Bidder must have successfully executed & implemented AMR/AMI projects in an Indian Power Distribution Utility during last 7 years ending last day of month previous to the one in which bids are invited.	No. of Projects	> = 10	10	10	
				>= 6 and < 10	7		
				>= 2 and < 6	5		
7	Quality Compliance	CMMi Level Certification of Bidder	CMMi Level	CMMi Level 5	10	10	
				CMMi Level 4	8		
				CMMi Level 3	6		
8	Meter Capacity	Min 2 years of experience in Smart meter manufacturing and supplied at least 25,000 AMI/AMR meters on RF/GPRS/In-built modem & related equipment to Global/Indian Power Utilities	No. of AMI/A MR Meters	>= 1,00,000	10	10	
				>= 25,000 and < 1,00,000	8		
				=25000	6		
						100	

FINANCIAL EVALUATION:

Bids shall be evaluated on the basis of the total evaluated value as per the quoted rates for the services mentioned in Scope of Work. The total evaluated price as per the evaluation methodology mentioned as under at Form - III of this tender document and the other details mentioned therein will be the basis for the evaluation purposes and for arriving at inter-se ranking of the various bidders of the tender.

Bidders should quote their rates/prices in Indian Rupees only which shall be inclusive of GST and other applicable taxes, duties, levies, insurance, transportation etc., applicable for entire scope of work as per Price Schedule included to Form - III of this tender document.

Bid shall be evaluated as per the "Total Price of the Bidder for this tender" as mentioned in Form-III, which shall be filled by the bidder as a Financial Bid.

REC PDCL reserves the right to postpone and/or extend the date of receipt/opening of Financial Bids or to withdraw the tender notice, without assigning any reason thereof. In any such cases, the bidders shall not be entitled to any form of compensation from the Company. RECPDCL also reserves right to conduct reverse auction as per Clause No. 2 of Section-V at its sole discretion, if required.

2. AWARD CRITERIA

The contract shall be awarded to the bidder whose Total price including GST and other applicable taxes etc. will be the lowest (L1), and whose bid has been determined to be in full conformity to the bid documents.

In case of Reverse Auction, all Technically Qualified bidders after Stage-II evaluation, as detailed under Clause 1 in Section VII, shall be allowed to participate in the reverse Auction and the bidder with lowest price after reverse auction shall be considered as the successful bidder.

3. COMMERCIAL TERMS & CONDITIONS

A. Taxes and duties

Notwithstanding anything contained herewith, with respect to taxes and duties following clauses shall be applicable:

A.1. If any supply of goods or services under or in respect of this contract is subject to GST, and if the bidder is liable to GST in relation to any supply under this contract, the parties agree that the amount of GST applicable on any supply from the bidder to the Employer under or in respect of this contract shall be reimbursed by the Employer on actual basis as applicable on the supply by the bidder in pursuance of the contract provided that the total payment made by Employer to the bidder including the reimbursement shall not in any case exceed the Contract Price. The same would be subject to the following:

a) The bidder shall also indicate the possible locations and respective GSTIN's from where the supply is proposed to be made by him. Any exemptions/ tax benefits, if applicable to the bidder on the date of submitting the price bid shall be indicated by him and for the purpose of calculation of the amount of GST to be reimbursed, the

Employer shall factor such exemptions/ tax exemptions irrespective of withdrawal of such exemptions/ tax benefits to the bidder during the execution of the Contract.

b) Invoice/Debit Note containing particulars specified under the GST Act and related Rules, Notifications, etc as prescribed by the Government in this regard, shall be considered as appropriate and necessary for taking reimbursement of the GST so charged.

c) In the event that the bidder fails to provide the invoice in the form and manner prescribed under the GST Act and Rules, the Employer shall not be liable to make any payment against such invoice.

A.2. Notwithstanding anything contained anywhere in the Contract, in the event that the input tax credit of the GST charged by the bidder is denied by the tax authorities to the Employer for reasons associated with non-compliance/ incorrect compliance by the bidder, the Employer shall be entitled to recover such amount from the bidder by way of adjustment from any of the subsequent invoices issued by the bidder on the Employer or in case no subsequent invoice is pending, the Employer shall recover such amount from the Performance Security. In addition to the amount of GST, the Employer shall also be entitled to recover interest at the rate of applicable SBI base interest rate and penalty, in case any penalty is imposed by the tax authorities. The Employer shall determine whether the denial of credit is linked to the non-compliance/ incorrect compliance of the bidder and the said determination shall be binding on the bidder.

Change in Law

A.3. Subject to clause A.2 above, if any rates of Tax are decreased or any change in interpretation or application of any Tax which entails a decrease in the Taxes declared by the bidder in the Price Schedule, which was or will be assessed on the bidder in connection with performance of the Contract (i.e. during scheduled completion period as per contract), an equitable adjustment of the Contract price shall be made to fully take into account any such change by deduction therefrom. However, if any rates of Tax are increased, which was or will be assessed on the bidder in connection with performance of the Contract, no change shall be made in the Contract Price and the Employer shall not reimburse any additional amount payable thereto.

A.4. Subject to clause A.2 and A.3 above, if a new Tax is introduced or an existing Tax is abolished, which was or will be assessed on the bidder in connection with performance of the Contract, an equitable adjustment of the Contract price shall be made to fully take into account any such change by addition to the Contract price or deduction therefrom.

A.5. These adjustment shall not be applicable on procurement of raw materials, intermediary components etc. and In respect of raw materials, intermediary components etc., neither Employer nor the bidder shall be entitled to claim arising due to increase or decrease in the rate of tax, introduction of new tax or abolition of an existing tax in the course of the performance of the contract.

B. Anti-profiteering measure

As per Section 171 of the Central Goods and Services Tax Act, 2017, any reduction in rate of tax on any supply of goods or services or the benefit of input tax credit shall be passed on to the recipient by way of commensurate reduction in prices. In pursuance of the above provision, bidder is required to factor in the credit efficiencies available under GST and benefit due to reduction in tax rate to the employer and accordingly, declare the prices in the Price Schedule.

C. Rate quoted by the bidder shall remain firm & fixed and shall be binding on the Successful Bidder till completion of work irrespective of actual cost of execution of the project. No escalation in rate quoted by the bidder will be granted on any reason whatsoever. The bidder shall not be entitled to claim any additional charges, even though it may be necessary to extend the completion period for any reasons whatsoever.

D. The offer must be kept valid for a period of 180 days from the last date of bid submission. No escalation clause would be accepted. The validity can be further extended as per requirement of RECPDCL. In case of requirement RECPDCL reserves right to ask bidder regarding extension of bid validity.

SECTION-VIII

TENDER FORMATS

Letter for Submission of Tender

To,
Addl. Chief Executive Officer
REC Power Distribution Company Ltd.,
A10, 4th Floor, Kribhco Bhawan,
Sector-1, Noida – 201301

Sub.: Engagement of Service Agency

Sir,

1. With reference to your Tender No. ---------------dated ------------ for Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM, I wish to apply for engagement with RECPDCL as service provider for "**Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM**"

    Further, I hereby certify that

    I have read the provisions of the all clauses and confirm that notwithstanding anything stated elsewhere to the contrary, the stipulation of all clauses of Tender are acceptable to me and I have not taken any deviation to any clause.

2. I further confirm that any deviation to any clause of Tender found anywhere in my Bid, shall stand unconditionally withdrawn, without any cost implication whatsoever to the REC PDCL.

3. Our bid shall remain valid for period of 180 days from the last date of bid submission.

Date: Signature…………………
Place: Full Name …………….....
                                                                Designation ....…
                                                                Address…………………

Note: In absence of above declaration/certification, the Bid is liable to be rejected and shall not be taken into account for evaluation.

PRE QUALIFICATION CRITERIA

Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM

1. Name(s) of the company/companies
2. Regd. Address
3. Corporate identity number   _____
4. Address of Office at Delhi/NCR   _____

5. Contact Person's

i) Name & Design.   _____

ii) Address   _____

iii) Tel No. Landline_____Mobile   _____

iv) Email ID____

6. Type of Company: Private Ltd./ Public Ltd.
       (Please tick)

7. PAN_____

8. GST Reg. No.:

9. E.M.D. Details   Rs._
                              DD No._
                              Name & Address of Bank

Please upload duly signed copies by authorized signatory of documentary evidence e.g. work order, corresponding satisfactory job completion certificates from clients with amount of work order in support of above and any other document indicated in prequalifying criteria)

Signature…………………
Full Name…………………
Designation……………….
Address …………………..

Financial Bid (To be submitted through online mode only)

PROFORMA OF SCHEDULE OF RATES

Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM

Bidder Name:

S.No.	Equipment	Unit	Quantity	Per Unit Cost	Total Cost	GST percentage		GST Tax amount			Total Price (incl. GST)
						CGST & SGST/UGST	IGST	CGST & SGST/UGST	IGST	Total Tax amount	
A	B	C	D	E	F=DXE	G	H	I=FXG	J=FXH	K=I+J	L=F+K
1	Meters										
1.1	Single phase whole current Smart Meter	Nos.	17490		0			0	0	0	0
1.2	Three Phase whole current Smart Meter	Nos.	10937		0			0	0	0	0
1.3	Three Phase whole current Smart Meter (Net-Meter)	Nos.	100		0			0	0	0	0
1.4	Three phase CT operated Smart Meter	Nos.	906		0			0	0	0	0
1.5	Three phase CT operated Smart Meter (for DT)	Nos.	402		0			0	0	0	0
1.6	Feeder Meter	Nos.	61		0			0	0	0	0
1.7	Data Concentrator Units	Nos.			0			0	0	0	0
	Sub Total 1										0
2	Mandatory Spares										
2.1	5% of Sub total 1	Lot	1								0
					0						0
3	Installation & Commissioning										
3.1	Cost of SITC* & Integration with Existing System	Lumpsum	1		0			0	0	0	0
	Sub Total 3										0
4	Other Requirement										
4.1	Any other product, if required, along with details.	Lumpsum	1		0			0	0	0	0
	Sub Total 4										0
	GRAND TOTAL										0

Form: 1 Meters Cost (BOQ)

S.No.	Equipment	Unit	Quantity	Per Unit Cost	Total Cost	GST percentage		GST Tax amount			Total Price (incl. GST)
						CGST & SGST/UGST	IGST	CGST & SGST/UGST	IGST	Total Tax amount	
A	B	C	D	E	F=DXE	G	H	I=FXG	J=FXH	K=I+J	L=F+K
1	Application Software										
1.1	Meter Data Acquisition Software (MDAS)/Head End System (HES)	Lot	1		0			0	0	0	0
1.2	Meter data management (MDM) capable of processing raw data, building of desired analytics like giving demand response signal, taking control / programming actions based on preset logic,	Lot	1		0			0	0	0	0

Form: 2 Softwares

S.No.		Description	Unit	Quantity		Total Cost								Total Price (incl. GST)
		interface with billing software being used by utility (30,000 Nos. of consumers and scalable up to 2 Lakhs, however initial licensees would be for 30000 consumers)												
		Sub Total 1												0
2		Data Archiving Software												
2.1		Data Archiving and SAN management software	Lot	1		0				0	0	0		0
		Sub Total 2												0
3		Network Management Software												
3.1		Centralized network management software along with patch management & identity management	Lot	1		0				0	0	0		0
3.2		Antivirus software for all machines in control centre	Lot	1		0				0	0	0		0
		Sub Total 3												0
4		Installation & Commissioning												
4.1		Cost of SITC* & Integration with Existing System	Lumpsum	1		0				0	0	0		0
		Sub Total 4												0
5		Other Requirement												
5.1		Any other product, if required, along with details.	Lumpsum	1		0				0	0	0		0
		Sub Total 5												0
		GRAND TOTAL												0

Form: 3 Hardwares											
S.No.	Equipment	Unit	Quantity	Per Unit Cost	Total Cost	GST percentage		GST Tax amount			Total Price (incl. GST)
						CGST & SGST/UGST	IGST	CGST & SGST/UGST	IGST	Total Tax amount	
A	B	C	D	E	F=DXE	G	H	I=FXG	J=FXH	K=I+J	L=F+K
1	Hardware for application										
1.1	Application Server suitable for MDAS/HES, MDM along with operating system	Set	2		0			0	0	0	0
1.2	Application server with minimum 4 GB RAM for development, quality and testing	Set	1		0			0	0	0	0
1.3	Web Server for access	Set	2		0			0	0	0	0
	Sub Total 1										0
2	Hardware for storage										
2.1	SAN based storage for storing Smart Meter data (30,000 nos.), data from MDM, SCADA, DTMU for 4 years.	No.	1		0			0	0	0	0

S.No.	Description	Unit	Qty								
2.2	Data Archiving Server	Nos.	2		0			0	0	0	0
	Sub Total 2										0
3	Hardware for network Management										
3.1	Network Management server with patch & identity management	Set	1		0			0	0	0	0
3.2	Centralized management console with single monitor	Set	1		0			0	0	0	0
	Sub Total 3										0
4	Workstation Consoles										
4.1	Workstation consoles with dual 24" monitor along with Operating System & license	Set	2		0			0	0	0	0
	Sub Total 4										0
5	Network Hardware										
5.1	Firewall with Network-based intrusion prevention system (NIPS) Minimum 8 Ethernet ports (1 Gbps) and 4 Fiber Optics Ports	Set	1		0			0	0	0	0
5.2	LAN Switch (24 port 1000 / 100 /10 Mbps, layer 3 switching, 8 Ethernet ports (1 Gbps))	Set	1		0			0	0	0	0
	Sub Total 5										0
6	Mandatory Spares										
6.1	5% of Subtotal 1+2+3+4+5	Lot	1								0
	Sub Total 6										0
7	Installation & Commissioning										
7.1	Cost of SITC* & Integration with Existing System	Lumpsum	1		0			0	0	0	0
	Sub Total 7										0
8	Other Requirement										
8.1	Any other product, if required, along with details.	Lumpsum	1		0			0	0	0	0
	Sub Total 8										0
	GRAND TOTAL										0

Form: 4 FMS		
S.No.	Equipment	FMS Cost
A	B	C
1	FMS charges for meters (Form 1) for 01 year	
2	FMS charges for Softwares (Form 2) for 01 year	
3	FMS charges for Hardwares (Form 3) for 01 year	
	Optional Items*	
4	FMS charges for Meters (Form 1) for additional 2 years (Optional)#	
5	FMS charges for Softwares (Form 2) for additional 2 years (Optional)#	
6	FMS charges for Hardwares (Form 3) for additional 2 years (Optional)#	

	Form: 5 Total		
S.No.	Equipment	Total Duration for 3 Years + 2 years (Optional) years after warranty	Total Cost for 3 years
A	B	C	D
1	Total Cost for Meters (Form 1)	1	0
2	Total Cost for Softwares (Form 2)	1	0
3	Total Cost for Hardwares (Form 3)	1	0
4	FMS charges for Meters (Form 1) for 3 years	3	0
5	FMS charges for Softwares (Form 2) for 3 years	3	0
6	FMS charges for Hardwares (Form 3) for 3 years	3	0
	Grand Total		0

Note:-

* - Initially the FMS will be for 3 years after 1 year warranty period, however FMS may be extended further for 2-3 years on same terms and conditions on mutual agreement between Utility & Vendor.

>The rates are invited for entering into an RC valid for one year from the date of issue of contract. Prices are to be quoted accordingly. The quantities mentioned above are for evaluation purposes only. Actual Quantities may vary as per site requirement and Release Orders against this Rate Contract (RC) shall be placed accordingly.
>The quoted rates must be inclusive of all taxes as applicable at the time of bidding.
>Bidders are to quote their rates strictly as per above format.
>Bidders has to fill the rates in all sub-sheets of excel file as per the format.
>Any increase or decrease in applicable GST rates shall be paid or deducted accordingly
> For further details pertaining to Financial Bid, refer to Section VII and other relevant clauses in the tender.
> RECPDCL may ask bidders to submit the HSN Code of the quoted items, wherever applicable, in the Financial bid

REC Power Distribution Company Limited	

FORMAT FOR NO-DEVIATION CERTIFICATE

We shall abide by all specifications and terms and conditions of the tender.

By signing this document, we hereby accept and comply to all the terms and conditions, technical specifications, scope of work etc. as mentioned in the bid document.

Seal of the Company:

Signature
Name

Note: In absence of above declaration/certification, the Bid is liable to be rejected and shall not be taken into account for evaluation.

REC Power Distribution Company Limited	

MANUFACTURER AUTHORIZATION FORM

(To be submitted on OEM's Letter Head)

Date: …………….
ICB No.: …………….
Invitation for Bid No.: …………..
Alternative No.: …….

To,
The Nodal Officer (Smart Grid Pilot Project)
Electricity 'OP' Division No. 2,
Opp. Transport Area, New Power House
Industrial Area Phase – 1, UT Chandigarh

Sir,
WHEREAS M/s. *[name of OEM],* who are official manufacturers of ………… having factories at *[address of OEM]* do hereby authorize M/s *[name of bidder]*to submit a Bid in relation to the Invitation for Bids indicated above, the purpose of which is to provide the following Goods, manufactured by us ………………………………………………………………………………………………….
and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with Special Conditions of Contract or as mentioned elsewhere in the Tender Document, with respect to the Goods offered by the above firm in reply to this Invitation for Bids.

We hereby confirm that in case, the channel partner fails to provide the necessary services as per the Tender Document referred above, M/s *[name of OEM]* shall provide standard warranty on the machines supplied against the contract. The warranty period and inclusion / exclusion of parts in the warranty shall remain same as defined in the contract issued to their channel partner against this tender enquiry.
Yours Sincerely,

For ……………..

Authorized Signatory
Note: In absence of above declaration/certification, the Bid is liable to be rejected and shall not be taken into account for evaluation.

REC Power Distribution Company Limited

Format of Curriculum Vitae

1	PROPOSED POSITION:				
2	NAME OF FIRM				
3	NAME OF STAFF:				
4	DATE OF BIRTH:		Nationality:		
5	EDUCATION:				
	DEGREE/EXAMINATION		YEAR	INSTITUTE	Board
6	MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS:				
7	OTHER TRAINING:				
8	COUNTRIES OF WORK EXPERIENCE:				
9	LANGUAGES:				
	LANGUAGE		SPEAKING	READING	WRITING
10	EMPLOYMENT RECORD:				
	FROM		TO	EMPLOYER	POSITIONS HELD
11	DETAILED TASKS ASSIGNED:				
12	WORK UNDERTAKEN THAT BEST ILLUSTRATES CAPABILITY TO HANDLE THE TASKS ASSIGNED:				
13	Certification:				
	I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.				
	Signature of authorised representative of the staff				
	Full name of authorised representative:				

REC Power Distribution Company Limited	

LETTER OF TRANSMITTAL

To: [Name and address of Client]

…………………………………………………………………

………………………………………………..…

…………………………………………

Dear Sir/s,

I/We, the undersigned, have examined the details given in your NIT dated [Insert Date] for Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM. We accept all the terms & conditions of the bid document without any deviation and submit the Bid. We hereby certify that M/s _____ and its consortium partners or its group companies have not been awarded any work for Rate Contract for Supply, Implementation and Maintenance of Smart Meters and AMI Communication System (AMI) for Smart Grid Pilot Project at Chandigarh Electricity Department (CED) under NSGM. Also, M/s _____ and its consortium partners or its group companies is not executing or providing any type of services either directly or as a sub-contractor for the particular work for which Bid is submitted. It is confirmed that M/s. _____ and its consortium partners is not banned or blacklisted by any Govt./Pvt. Institutions in India.

Authorized Signature [In full and initials]:

Name and Title of Signatory:

Name of Firm:
Address:

(To be executed on non-judicial paper)

INTEGRITY PACT

Between

REC Power Distribution Company Ltd (REC PDCL) hereinafter referred to as "The Principal",

And

…………………………………..hereinafter referred to as "Bidder "

Preamble

The Principal intends to award, under laid down organization procedures, contract/s for ………………..The Principal values full compliance with all relevant laws and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder/s, agency/s.

In order to achieve these goals, the Principal cooperates with the renowned international Non-Governmental Organisation "Transparency International" (TI). Following TI's national and international experience, the Principal will appoint an Independent External Monitor who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

(1) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:

   a) No employee of the Principal, personally or through family members, will in connection with the tender, or the execution of the contract, demand, take a promise for or accept, for himself/herself or third person, any material or immaterial benefit which he/she is not legally entitled to.

   b) The Principal will, during the tender process, treat all Bidders with equity and reason. The Principal will, in particular, before and during the tender process, provide to all Bidders the same information and will not provide to any Bidder confidential / additional information through which the Bidder could obtain an advantage in relation to the tender process or the contract execution.

   c) The Principal will exclude from the process all known prejudiced persons.

(2) If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the relevant Anti-Corruption Laws of India, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder / agency.

(1) The Bidder / agency commits itself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

   a) The Bidder /agency will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person, any material or immaterial benefit which he/she is not legally entitled to, in order to obtain in exchange, any advantage of any kind whatsoever during the tender process or during the execution of the contract.

b) The Bidder / agency will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelisation in the bidding process.

c) The Bidder / agency will not commit any offence under the relevant Anti-Corruption Laws of India; further the Bidder / agency will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d) The Bidder / agency will, when presenting his bid, disclose any and all payments he has made, is committed to, or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

(2) The Bidder / agency will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Agency, before contract award, has committed a transgression through a violation of Section 2 or in any other form such as to put his reliability or credibility as Bidder into question, the Principal is entitled to disqualify the Bidder from the tender process or to terminate the contract, if already signed, for such reason.

(1) If the agency has committed a transgression through a violation of Section 2 such as to put his reliability or credibility into question, the Principal is also entitled to exclude the agency from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, in particular the number of transgressions, the position of the transgressors within the company hierarchy of the Bidder and the amount of the damage. The exclusion will be imposed for a minimum of 6 months and maximum of 3 years.

(2) A transgression is considered to have occurred if the Principal after due consideration of the available evidences, concludes that no reasonable doubt is possible.

(3) The Bidder accepts and undertakes to respect and uphold the Principal's absolute right to resort to and impose such exclusion and further accepts and undertakes not to challenge or question such exclusion on any ground, including the lack of any hearing before the decision to resort to such exclusion is taken. This undertaking is given freely and after obtaining independent legal advice.

(4) If the agency can prove that he has restored / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal may revoke the exclusion prematurely.

Section 4 – Compensation for Damages

(1) If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover from the Bidder liquidated damages equivalent to Earnest Money Deposit/Bid Security.

(2) If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Consulting agency/Architect/Supplier liquidated damages equivalent to Security Deposit / Performance Bank Guarantee.

(3) The Bidder agrees and undertakes to pay the said amounts without protest or demur subject only to condition that if the agency can prove and establish that the exclusion of the Bidder from the tender process or the termination of the contract after the contract award has caused no damage or less damage than the amount of the liquidated damages, the agency shall compensate the Principal only to the extent of the damage in the amount proved.

Section 5 – Previous Transgression

(1) The Bidder declares that no previous transgression occurred in the last 3 years with any other Company in any country conforming to the TI approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all agency

(1) The agency undertakes to demand from all sub-consulting agency a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.

(2) The Principal will enter into agreements with identical conditions as this one with all agency and Sub-consulting agency.

(3) The Principal will disqualify from the tender process all Bidders who do not sign this Pact or violate its provisions.

Section 7 – Punitive Action against violating agency /Sub-consulting agency/

If the Principal obtains knowledge of conduct of a agency or Sub-consulting agency, or of an employee or a representative or an associate of a agency, Sub-consulting agency\ which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 – Independent External Monitors

(1) The Principal has appointed competent and credible Independent External Monitors for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

(2) The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the Chairperson of the Board of the Principal.

(3) The agency accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the agency. The agency will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to this project documentation. The same is applicable to Sub-consulting agency. The Monitor is under contractual obligation to treat the information and documents of the agency or Sub-consulting agency with confidentially.

(4) The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the agency. The parties offer to the Monitor the option to participate in such meetings.

(5) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or heal the violation, or to take other relevant action. The Monitor can in this regard submit non- binding recommendation. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action. However, the Independent External Monitor shall give an opportunity to the agency to present its case before making its recommendations to the Principal.

(6) The Monitor will submit a written report to the Chairperson of the Board of the Principal within 8 to 10 weeks from the date of reference or intimation to him by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.

(7) If the Monitor has reported to the Chairperson of the Board a substantiated suspicion of an offence under relevant Anti-Corruption Laws of India, and the Chairperson has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

(8) The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

This Pact begins when both parties have legally signed it. It expires for the agency 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded.

If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged / determined by Chairperson of the Principal.

Section 10 – Other provisions

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. New Delhi. The Arbitration clause provided in the main tender document / contract shall not be applicable for any issue / dispute arising under Integrity Pact.

(2) Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

(3) If the Bidder is a consortium, this agreement must be signed by all consortium members.

(4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

…………….………… ..…………………………

For the Principal for the Bidder

Place ………………..… Witness1: (Signature/Name/Address)

Date ……………..…. Witness2: (Signature/Name/Address)

REC Power Distribution Company Limited	

Annexure A

PERFORMANCE BANK GUARANTEE

M/s. REC Power Distribution Company Ltd.
A10, 4th Floor, Kribhco Bhawan,
Sector-1, Noida – 201301
(With due Rs.100/- stamp duty, if applicable)

OUR LETTER OF GUARANTEE No. : ……….................... Date: ………………

Amount: …………………. Valid Date: ………….

Bank Name & Address: ………………………………………………………………………………………

In consideration of REC Power Distribution Company Ltd. having its office ^{at} A10, 4th Floor, Kribhco Bhawan,Sector-1, Noida – 201301(hereinafter referred to as "RECPDCL" which expression shall unless repugnant to the content or meaning there of include all its successors, administrators and executors) and having entered into an agreement dated _____/issued Work Order No._____ dated _____with/on as_____ (hereinafter referred to as "The service" which expression unless repugnant to the content or meaning thereof, shall include all the successors, Administrators and executors).

WHEREAS the Agency having unequivocally accepted to supply the materials as per terms and conditions given in the Agreement accepted to providing service as per terms and conditions given in the Agreement dated _____ /Work Order No. _____ dated _____ and RECPDCL having agreed that the Agency shall furnish to RECPDCL a Performance Guarantee for the faithful performance of the entire contract, to the extent of 10% (ten percent) (or the percentage as per the individual case) of the value of the Work Order i.e. for _____.

We, _____(The Bank) which shall include OUR successors, administrators and executors herewith establish an irrevocable and unconditional Letter of Guarantee No. _____ in your favour for account of _____ (The Agency) in cover of performance guarantee in accordance with the terms and conditions of the Agreement/work Order.

Hereby, we undertake to pay upto but not exceeding _____ (say _____ only) upon receipt by us of your first written demand accompanied by your declaration stating that the amount Claimed is due by reason of the Agency having failed to perform the Agreement and despite any contestation on the part of above named Agency.

This Letter of Guarantee will expire on _____ plus 60 days of claim period and any claims made hereunder must be received by us on or before expiry date after which date this Letter of Guarantee will become of no effect whatsoever whether returned to us or not.

_____
Authorized Signature
Chief Manager/Manger
Seal of Bank

Annexure B

ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT
(To be signed and stamped by the bidder)

In a bid to make our entire procurement process more fair and transparent, RECPDCL intends to use the reverse auctions as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

The following terms and conditions are accepted by the bidder on participation in the bid event:

1. RECPDCL shall provide the user id and password to the authorized representative of the bidder. *(Authorization Letter in lieu of the same shall be submitted along with the signed and stamped Acceptance Form).*

2. RECPDCL decision to award the work would be final and binding on the supplier.

3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of RECPDCL, bid process, bid technology, bid documentation and bid details to any other party.

4. The bidder is advised to fully make aware themselves of auto bid process and ensure their participation in the event of reverse auction and failing to which RECPDCL will not be liable in any way.

5. In case of bidding through Internet medium, bidders are further advised to ensure availability of the infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs, power failure or any other reason shall not be the responsibility of RECPDCL.

6. In case of intranet medium, RECPDCL shall provide the infrastructure to bidders. Further, RECPDCL has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case an auction event is restarted, the best bid as already available in the system shall become the basis for determining start price of the new auction.

7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out rightly rejected by RECPDCL.

8. The bidder shall be prepared with competitive price quotes on the day of the bidding event.

9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR at site.

10. The prices submitted by a bidder during the auction event shall be binding on the bidder.

11. No requests for time extension of the auction event shall be considered by RECPDCL.

12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all-inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

Signature & Seal of the Bidder

REC Power Distribution Company Limited	

<u>Annexure C</u>

BID BANK GUARANTEE (EARNEST MONEY)

(To be stamped in accordance with Stamp act)

This deed of Guarantee made this _____ day of _____2017 by_____

((*Name of the Bank)*

having one its branch at _____ acting through its Manager (hereinafter called the "Bank") which expression shall wherever the context so requires includes its successors and permitted assigns in favour of REC Power Distribution Company Ltd., registered under the Companies Act, 1956, having its office at _____(hereinafter called) ("RECPDCL") which expression shall include its successors and assigns.

WHEREAS RECPDCL has invited tender vide their Tender Notice No. _____ Dated _____ to be opened on AND WHEREAS M/s _____
(Name of Tenderer)
having its office at _____
(hereinafter called the "Tenderer"), has/have in response to aforesaid tender notice offered to supply/ do the job _____ as contained in the tender.

AND WHEREAS the Tender is required to furnish to RECPDCL a Bank Guarantee for a sum of Rs. _____ (Rupees_____ _____Only) as Earnest Money for participation in the Tender aforesaid.

AND WHEREAS, we _____
(Name of Bank) have at the request of the tenderer agree to give RECPDCL this as hereinafter contained.

NOW, THEREFORE, in consideration of the promises we, the undersigned, hereby covenant that, the aforesaid Tender shall remain open for acceptance by RECPDCL during the period of validity as mentioned in the Tender or any extension thereof as RECPDCL and the Tenderer may subsequently agree and if the Tenderer for any reason back out, whether expressly or impliedly, from his said Tender during the period of its validity or any extension thereof as aforesaid or fail to furnish Bank Guarantee for performance as per terms of the aforesaid Tender, we hereby undertake to pay RECPDCL, New Delhi on demand without demur to the extent of Rs._____(Rupees_____ only).

We further agree as follows:-

01. That RECPDCL may without affecting this guarantee extend the period of validity of the said Tender or grant other indulgence to or negotiate further with the Tenderer in regard to the conditions contained in the said tender or thereby modify these conditions or add thereto

any further conditions as may be mutually agreed to in between RECPDCL and the Tender AND the said Bank shall not be released from its liability under these presents by an exercise by RECPDCL of its liberty with reference to the matters aforesaid or by reason of time being given to the Tenderer or any other forbearance, act or omission on the part of the RECPDCL or any indulgence by RECPDCL to the said Tenderer or any other matter or thing whatsoever.

02. The Bank hereby waive all rights at any time in consistent with the terms of this Guarantee and the obligations of the Bank in terms thereof shall not be otherwise affected or suspended by reason of any dispute or dispute having been raised by the Tenderer (whether or not pending before any arbitrator, tribunal or court) or any denial of liability by the Tenderer stopping or preventing or purporting to stop or prevent any payment by the Bank to RECPDCL in terms thereof.

03. We the said Bank, lastly undertake not to revoke this Guarantee during its currency except with the previous consent of RECPDCL in writhing and agree that any charges in the constitution, winding up, dissolution or insolvency of the Tenderer, the said Bank shall not be discharged from their liability.

NOTWITHSTADING anything contained above, the liability of the Bank in respect of this Guarantee is restricted to the said sum of Rs. _____ (Rupees _____ only) and this Guarantee shall remain in force till _____ unless a claim under this guarantee is filed with the bank within 30 (thirty) days from this date or the extended date, as the case may be i.e. upto _____ all rights under Guarantee shall lapse and the Bank be discharged from all liabilities hereunder.

In witness whereof the Bank has subscribed and set its name and seal here under.

Note: - The date shall be thirty (30) days after the last date for which the bid is valid.

REC Power Distribution Company Limited	

Consortium and OEM Structure

1. Bid Structure

In case of consortium, the bidder shall clearly specify the Structure of consortium as detailed below

S. No.	Consortium Structure	Name of firm
1	Lead Bidders Name	
2	Consortium Partner 1(optional)	
3	Consortium Partner 2(optional)	

2. AMI Components OEM Detail

The bidder shall clearly specify the OEMs of various components of AMI as attached below.:

S.No	AMI Component	OEM Name
1	Smart Meter	
	Single phase whole current Smart meter	
	Three Phase whole current Smart meter	
	Three-phase whole current Smart meter with Net metering	
	Three Phase CT operated Smart meter	
	Three Phase CT operated Smart meter for DT	
	Feeder Meter	
2	RF Canopy Provider	
3	Network Bandwidth Provider	
4	HES	
5	MDM	
6	Others	

REC Power Distribution Company Limited	

Document Indexing

Bidder will submit an Index of documents submitted with this bid mentioning following details. This index will be used to locate the document easily and correlating correct document with correct QR as per Section-VI in following format:

S.No.	QR clause and page number as per NIT	Title of document submitted against each QR	Relevant page number in document.	Relevant clause no. in document.
1				
2				
3				
4				
5				

	REC Power Distribution Company Limited		

Self – Assessment of Technical Marks

Sr. No	Particulars	Requirement	Units	Criteria	Score	Max Marks	Self assessed Marks & Supporting Documents
1	Lead Bidder/OEM/ AMI Software provider Financial Strength	The minimum average annual turnover of the bidder shall be a minimum of ₹ 17.10 Crores during the last 3 years ending 31st Mar, 2017 of the previous financial year.	MAAT	>100 Crores	10	10	
				>30 Crs and =< 100 Crs	8		
				> 25 Crores and =<30 crores	6		
				> 17.10 Crores and =<25 crores	4		
2	Proposed MDM Experience of MDM Provider	MDM global presence in last 5 years in terms of number of consumers in power, gas and water sector	No. of Consumers	> 500 K	10	10	
				>100 K and =< 500 K	8		
				>= 10 K and =< 100 K	6		
3	Man-power Experience	The Bidder should have at least 5 personnel on its rolls with a minimum AMR/AMI implementation experience of 2 years (either in his/her own or other organization). The roles & responsibilities of the personnel should include development and/or customization of AMR/AMI System.	No. of Persons	>10	5	5	
				> 5 and =<10	4		
				=5	3		
		Experience of proposed Project Manager (with B.E. /	Years of profess	> 10 Years	5	5	
				> 7 Years to = <10 Years	4		

		B.Tech degree or equivalent) in power distribution / transmission sector.	ional Experience after B.E./B. Tech	>= 5 Years to =<7 Years	3		
4	Experience	The Bidder must have successfully executed & implemented AMR/AMI projects in an Indian/Global Power Distribution Utility during last 7 years ending last day of month previous to the one in which bids are invited, covering implementation of minimum 12,000 nos. of Meters with required hardware, software and other associated accessories	No. of Projects	Total project completed cumulatively with >= 45000 meters installation during last 7 years ending last day of month previous to the one in which bids are invited (however at-least one project should cover installation of at-least 24000 meters)	30		
				Total project completed cumulatively with >=35000 and < 45000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited (however at-least one project should cover installation of at-least 24000 meters)	25	30	
				01 No. of project completed with > =24,000 and < 35000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited	20		
				02 Nos. of projects completed, with >=15,000 and < 24000 meters installation, during last 7 years ending	15		

				last day of month previous to the one in which bids are invited		
				03 Nos. of projects completed, with >=12,000 and < 15000 meters installation, during last 7 years ending last day of month previous to the one in which bids are invited.	10	
5	Experience in Smart Grids implementation	To establish the experience of Smart Meters / AMI Systems, bidder must have implemented / implementing at least 1000 Nos. of Smart Meters having single & three phase Smart Metering System.	No. of Smart/ AMI Meters	>= 50,000	10	10
				>= 1000 and < 50,000	7	
				= 1000 Nos.	5	
6	Indian Power Distribution Utility	Bidder must have successfully executed & implemented AMR/AMI projects in an Indian Power Distribution Utility during last 7 years ending last day of month previous to the one in which bids are invited.	No. of Projects	> = 10	10	10
				>= 6 and < 10	7	
				>= 2 and < 6	5	
7	Quality Compliance	CMMi Level Certification of Bidder	CMMi Level	CMMi Level 5	10	10
				CMMi Level 4	8	
				CMMi Level 3	6	
8	Meter Capacity	Min 2 years of experience in Smart meter manufacturing and supplied at least 25,000	No. of AMI/A MR Meters	>= 1,00,000	10	10
				>= 25,000 and < 1,00,000	8	
				=25000	6	

		AMI/AMR meters on RF/GPRS/In-built modem & related equipment to Global/Indian Power Utilities						
							100	

REC Power Distribution Company Limited

Mandatory Technical Compliance Bidder

The Bidder should ensure the following Mandatory Technical Compliance during design and Engineering of AMI Systems and submit the duly signed document along with the bid:

S. No.	Solution Specifications
A.1	The solution shall be designed with Service Oriented Architecture. The solution shall be designed based on Component-based approach. It shall be highly granular and loosely coupled to ensure that the failure of one component does not cascade to others.
A.2	The solution shall be designed on web based architecture.
A.3	The solution shall be horizontally and vertically scalable and also have virtualization capability.
A.4	The solution shall be designed with Open Industry Standards and not with Supplier's proprietary protocol.
A.5	The directory services shall be based on commonly accepted application protocol like LDAP.
A.6	The proposed solution should be based on WS-* specifications (Web services specifications) & unified access framework compliant to W3C (World Wide Web Consortium) specifications.
A.7	The application shall provide the functionality to configure the parameters to define the business rules with the application. These parameters shall not be hard-coded in the application.
A.8	The solution shall provide the functionality to configure the roles & responsibilities and grant role based access to the users. Also, the system shall have the capability to integrate with various standard SSO (Single Sign-On) or IDM (Identity Management) applications.
A.9	The solution shall use an integration middleware layer so that all required external systems shall be integrated on a continuous basis.
A.10	The solution shall provide the functionality to encrypt the data stored or transmitted data.
A.11	The solution shall provide the functionality to maintain the audit trail of all critical transactions.
A.12	The solution shall be able to interoperate with: • standard RDBMS platforms like Oracle, MS SQL, MY SQL, DB2, Informix, Sybaseor any other RDBMS confirming to ANSI/ISO SQL-200n standards • Operating systems like Windows, UNIX, and Solaris etc. • web browsers like Internet explorer, Mozilla Firefox, Opera etc.

S. No.	Solution Specifications
A.13	The solution shall be installed with the latest security updates provided by software Supplier.
A.14	The software version shall be supported by the software vendor for a minimum period of next five years.
A1	Module: AMI
A1.1	The AMI Solution shall be capable of collecting and analyzing data on a common data structure/ format from system/ consumer meters of various makes and models. The solution shall be compatible with present Modbus compliant meters installed in utilities as well as future meters likely to be introduced in Indian market complying with MODBUS/DLMS /COSEM/IEC-62056/ANSI C-12.19/IEEE P-1377 Standards.
A1.2	The regional hierarchy and network topology shall be specific to the Indian context and flexible enough to account for different voltage levels in Indian sub-transmission and distribution networks e.g. 66/33/22/11/ 0.4 KV.

Annexure H
E-Reverse Auction Guidelines

These Guidelines are intended to guide about e-Reverse Auction processes, awarding criteria, and confidentiality requirements, and to the binding nature of bids made at e-Reverse Auction.

The aim of e-Reverse Auctions is to enable negotiations to be engaged in using technology that allows a faster pricing process, a more objective way of selecting bidders and greater transparency of market prices. REC and bidders are expected to follow the standards set forth in these Guidelines.
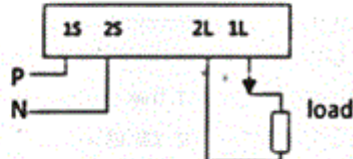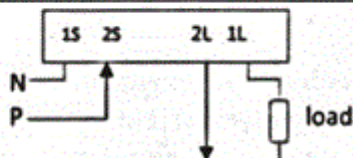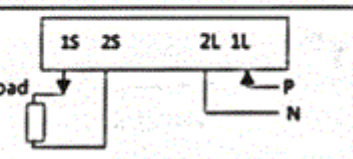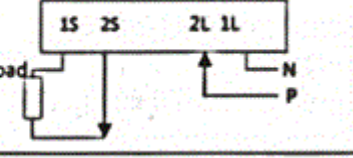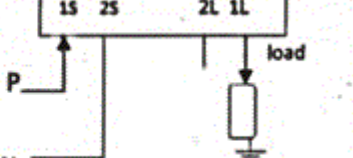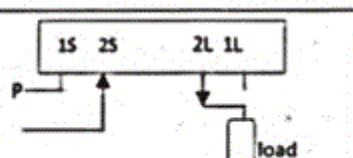
1. Reverse Auctions are carried out under the framework of rules as defined by RECPDCL and all bidders participating in Reverse Auction shall understand/accept and give an undertaking for compliance with the same to the REC in the prescribed format (Annexure – B).

2. Any bidder not willing to submit such an undertaking shall be disqualified for further participation with respect to the said procurement.

3. Reverse Auction shall be carried out amongst the bidders who have quoted within lowest price + 15% of the evaluation criteria price. However in case no other bidders fall within +15% of L-1 quoted prices then reverse auction can take place up to lowest price + 25% or as decided by RECPDCL shall be allowed to participate in the online Reverse Auctioning.

4. The overall lowest price quoted by the bidder will be considered as Reserve Base Price during reverse auction, further the item wise price of all items shall be arrived from the overall lowest quoted price in the same ratio as quoted by the bidders earlier in the financial bid and all the technically qualified bidders will be considered at same platform.

5. Decrement value to be kept for conducting Reverse Auction shall range from 0.50% to 5% of the Reserve Base Price converted to the nearest round figure, depending upon the value of the bid.

6. Preferably the time duration to be kept for conducting Reverse Auction process is from 11:00 AM to 3:00 PM with the incremental time duration of 30 minutes from the time of last quote considering that the bidder may be provided the sufficient time for quoting their best lowest rates. The window may be extended to accommodate 30 minutes, if required, response time. The auction will terminate either at the scheduled end time or as extended as per requirement till there is no response during the incremental time duration. However RECPDCL reserves the right to modify the process with pre-information to bidders if required.

7. The eligible bidders can participate in the online Reverse Auction from any place of their choice and need not to visit RECPDCL office for this purpose.
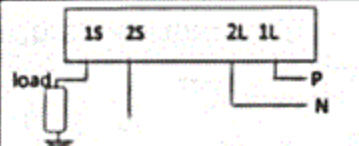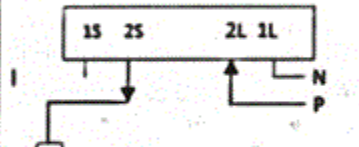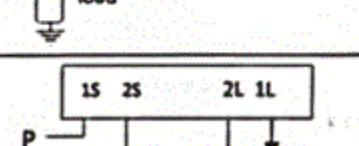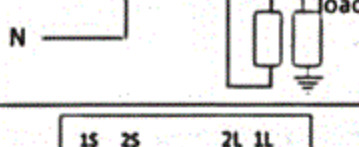
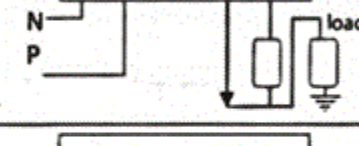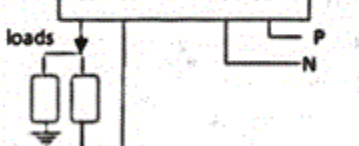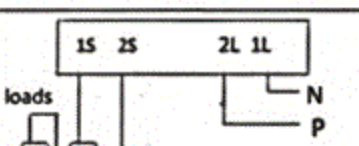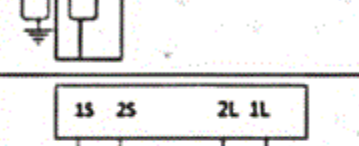| REC Power Distribution Company Limited	

8. The User ID and password for online reverse auction is same as used in online bidding process/ provided at the time of bidder registration.

9. The Reserve Base Price for Reverse Auction will be informed after the Opening of Price Bid. This shall be the lowest rate received against the initial price bids submitted by participating bidders.

10. RECPDCL shall make all out efforts to rectify the problem(s) leading to system failure during the online reverse auction. However in case the system could not be restored within the reasonable time period as deemed fit by RECPDCL, the reverse auction event shall be suitable extended/ shall be restarted again after rectification by giving a new schedule for the same, which shall cover the left over time period as per the original schedule. On restart of reverse auction the last R1 price received during reverse auction at which the reverse auction event got terminated, shall be the starting price.

11. Where necessary, RECPDCL will facilitate training for participation in Reverse Auction either on its own or through the service provider for the Reverse Auction to familiarize the vendors/bidders with Reverse Auction process.

12. Any vendor/bidder not participating in training shall do so at his own risk and it shall not be open for him to make any complaint/grievance later.

13. No request for postponement/fixing of Training Date/Time shall be entertained.

14. The Date and Time of commencement of Reverse Auction shall be communicated to the shortlisted bidders at least One day in advance.

15. Any force majeure or other condition leading to postponement of auction shall entitle RECPDCL to postpone the auction.

16. The Reverse Auction may be conducted by RECPDCL through a service provider specifically identified/appointed/empanelled by RECPDCL.

17. In case Reverse Auctions conducted by RECPDCL through a Service Provider, the REC shall enter into a separate agreement clearly detailing the role and responsibilities of the service provider hosting the web portal for the Reverse Auction. The Service Level Agreement (SLA) by RECPDCL with the service provider is an arrangement for smooth and fair conduct of the Reverse Auction.

18. All the bids made from the log-in ID given to bidder shall ipso facto be considered. Bids are to be made by the vendor / bidder using log-in ID and password assigned by the service provider /auctioneer.

Note: RECPDCL reserves right to amend/modify the procedure of reverse auction at its sole discretion.
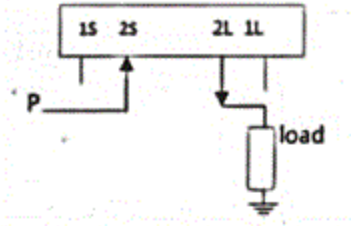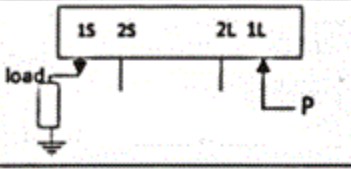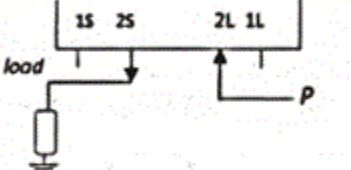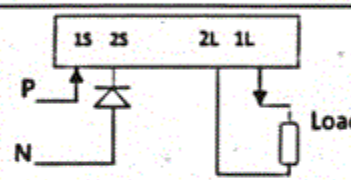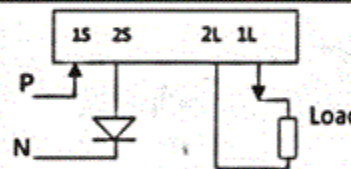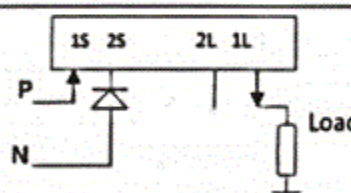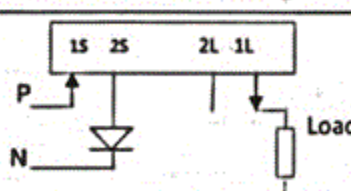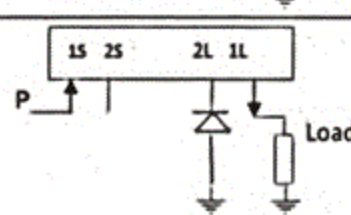
Annexure – 1

38 TAMPER CONDITIONS

CONDITION NO.	DESCRIPTION	GRAPHICAL VIEW
1.	Normal Wiring.	
2.	Normal wiring and voltage reversed.	
3.	Phase & Neutral interchanged, Current reversed.	
4.	Phase and Neutral interchanged, current reversed and voltage reversed.	
5.	Full load earth returned.	
6.	Full load earth returned and voltage reversed.	

7.	Full load earth returned, voltage interchanged &current reversed.	
8.	Full load earth returned, voltage interchanged & current reversed, voltage reversed.	
9.	Partial load earth returned.	
10.	Partial load earth returned, voltage reversed.	
11.	Partial load earth returned, voltage interchanged &current reversed.	
12.	Partial load earth returned, voltage interchanged &current reversed, voltage reversed.	
13.	Neutral current reversed.	
14.	Phase current reversed, voltage reversed.	

15.	Phase current reversed, voltage interchanged.	
16.	Neutral current reversed, voltage interchanged & reversed.	
17.	Partial load earth returned & neutral current reversed.	
18.	Partial load earth returned & neutral current reversed, voltage reversed	
19.	Partial load earth returned & neutral current reversed, voltage reversed.	
20.	Partial load earth returned & neutral current reversed, voltage reversed, voltage interchanged.	
21.	Current Bypassed	
22.	Neutral removal(missing)	

23.	Neutral removal (missing), voltage reversed.	
24.	Neutral removal (missing) & current reversed, voltage reversed, voltage interchanged.	
25.	Neutral removal (missing) & current reversed, voltage reversed, voltage interchanged.	
26.	Diode reversed in neutral	
27.	Diode in neutral	
28.	Diode reversed in neutral, load earthed	
29.	Diode in neutral, load earthed	
30.	Reversed diode earthed in output neutral, load earthed	

31.	Diode earthed in output neutral, load earthed	
32.	Variable resistor earthed in output neutral, neutral missing, load earthed	
33.	Variable capacitance earthed in output neutral missing, load earthed	
34.	Chopper in neutral	
35.	Chopper in neutral, load earthed	
36.	Chopper earthed in output neutral, neutral missing, load earthed	
37.	Variable resistor earthed in neutral diode in output neutral, load earthed	

38.	Timer in output neutral, load earthed	
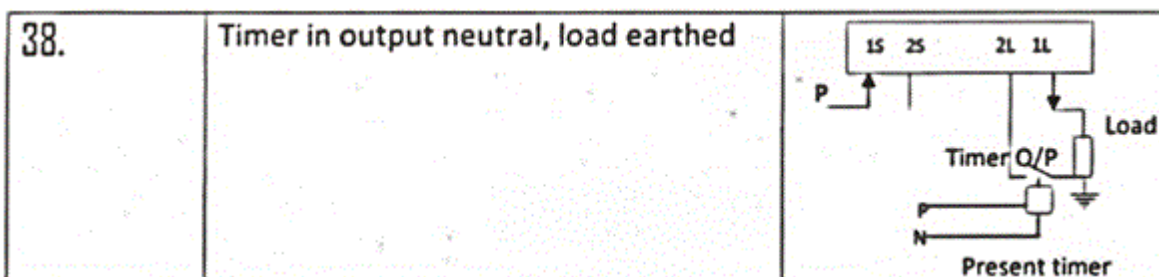
ABBREVIATION

AB Switch	Air Break Switch
AC	Alternating Current
ACDB	Alternating Current Distribution Board
ACL	Access Control List
AES	Advanced Encryption Standard
ALG	Application Layer Gateway
AMI	Advanced Metering Infrastructure
ANSI	American National Standards Institute
ARP	Address Resolution Protocol
ASIC	Application Specific Integrated Circuit
AT&C	Aggregate Technical & Commercial
BCS	Base Computer Software
BGP	Border Gateway Protocol
BIOS	Basic Input / Output System
BIS	Bureau of Indian Standards
BOQ	Bill of Quantities
CBIP	Central Board of Irrigation & Power
CCC	Customer Care Centre
CEA	Central Electricity Authority
CED	Chandigarh Electricity Department
CERT-In	Indian Computer Emergency Response Team
CGRF	Consumer Grievance Redressal Forum
CIM	Customer Interaction Meeting
CIM	Common Information Model
CIPET	Central Institute of Plastic Engineering and Technology
CMC	Centralized Monitoring Console
COSEM	Companion Specification for Energy Metering
CPP	Critical Peak Pricing
CPRI	Central Power Research Institute
CPU	Central Processing Unit
CRM	Customer Relationship Manager
CT	Current Transformer
CUM	Cumulative
DAS	Distribution Automation Scheme
dB	Decibel
DCU	Data Concentrator Unit
DDoS	Distributed Denial of Service
DC	Direct Current
DG	Diesel Generator
DES	Data Encryption Standard
DHCP	Dynamic Host Configuration Protocol
DLMS	Device Language Message Specification
DMC	Dough Moldings Compound

DMS	Distribution Management System
DMZ	Demilitarized Zone
DNP	Distributed Network Protocol
DNS	Domain Name System
DoD	Depth of Discharge
DoS	Denial of Service
DR	Demand Response
DSM	Demand Side Management
DT	Distribution Transformer
DTMU	Distribution Transformer Monitoring Unit
DTMS	Distribution Transformer Monitoring System
DTR	Distribution Transformer
DVD	Digital Video Disk
DXF	Drawing exchange Format
EAP	Extensible Authentication Protocol
ECS	Electronic Clearing Scheme
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ERP	Enterprise Resource Planning
ESB	Enterprise Service Bus
ESD	Electrostatic Discharge
FAT	Factory Acceptance Test
FMS	Facility Management System
FIFO	First In First Out
FPR	Field, Problem, Report
FSR	Field Service Report
FTP	File Transfer Protocol
GB	Gigabyte
GIS	Geographic Information System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
GUI	Graphical User Interface
HD	High Definition
HDD	Hard Disk Drive
HES	Head End System
HF	High Frequency
HHU	Hand Held Unit
HIDS	Host based Intrusion Prevention system
HT	High Tension
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
ICMP	Internet Control Message Protocol
ICs	Integrated Circuits
IEC	International Electro technical Commission

IKE	Internet Key Exchange
IP	Internet Protocol
IPCP	Internet Protocol Control Protocol
IrDA	Infrared Data Association
IS	Indian Standard
iSCSI	Internet Small Computer System Interface
ISO	International Organization for Standardization
ISP	Internet Service Provider
IST	Indian Standard Time
IT	Information Technology
IVR	Interactive Voice Response
KVM Switch	Keyboard, Video & Mouse Switch
LAN	Local Area Network
LCD	Liquid Crystal Display
LDAP	Lightweight Directory Access Protocol
LDC	Load Dispatch Centre
LED	Light Emitting Diode
LT	Low Tension
MCB	Miniature Circuit Breaker
MCCB	Molded Case Circuit Breaker
MD5	Message-digest algorithm
MDAS	Meter Data Acquisition System
MDM	Meter Data Management
MFT	Multi-Function Transducer
MGCP	Media Gateway Control Protocol
MIP	Mapped Internet Protocol
MIS	Management Information System
MPLS	Multiprotocol Label Switching
MU	Million Unit
NABL	National Accreditation Board for Testing and Calibration Laboratories
NAN	Neighborhood Area Network
NAT	Network Address Translation
NCIIPC	National Critical Information Infrastructure Protection Centre
NIPS	Network based Intrusion Prevention system
NMS	Network Management System
NPL	National Physical Laboratory
NTP	National Time Protocol
NVM	Non Volatile Memory
O & M	Operation & Maintenance
OEM	Original Equipment Manufacturer
OH	Over Head
OMS	Outage Management System
OS	Operating System
OSF	Open Software Foundation
OSPF	Open Shortest Path First

PAT	Port Address Translation
PC	Personal Computer
PCB	Printed Circuit Board
PERT	Program Evaluation and Review Technique
PF	Power Factor
PLC	Power Line Communication
PLM	Peak Load Management
POP3	Post Office Protocol 3
PPPoE	Point-to-Point Protocol over Ethernet
PSTN	Public Switch Telephone Network
PT	Potential Transformer
PTH	Plated Through Hole
PV	Photo Voltaic
PVC	Polyvinyl Chloride
QAP	Quality Assurance Plan
QR	Qualifying Requirement
RADIUS	Remote Authentication Dial-In User Service
RAID	Redundant Array of Inexpensive Disks
RAM	Read Access Memory
R-APDRP	Restructured Accelerated Power Development and Reforms Program
RF	Radio Frequency
RMU	Ring Main Unit
RoHS	Restriction of Hazardous Substance
RPC	Remote Procedure Call
RPO	Renewable Power Obligation
RSTP	Rapid Spanning Tree Protocol
RTC	Real Time Clock
RTP	Real Time Pricing
RTU	Remote Terminal Unit
SAE	Surface Vehicle Recommended Practice
SAN	Storage Area Network
SAT	Site Acceptance Test
SCADA	Supervisory Control and Data Acquisition
SCCP	Skinny Client Control Protocol
SGAs	Smart Grid Applications
SHA	Secure Hash Algorithm
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SITC	Supply, Installation , Testing and Commissioning
SMC	Sheet Moldings Compounds
SMPS	Switching Mode Power Supply
SMS	Short Message Services
SMT	Surface Mount Technology
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol

SNTP	Simple Network Time Protocol
SOA	Service Oriented Architecture
SRAM	Static Random Access Memory
Sun-RPC	Sun Remote Procedure Call
TB	Terabyte
TCP	Transmission Control Protocol
TDD	Total Demand Distortion
TFT	Thin-film Transistor
THD	Total Harmonic Distortion
THQ	Total Hour in Quarter
ToD	Time of Day
ToU	Time of Use
TS	Technical Specification
UDP	User Datagram Protocol
UG	Under Ground
UGVCL	Uttar Gujarat Vij Company Limited
UI	Unscheduled Interchange
UPS	Uninterruptable Power Supply
USB	Universal Serial Bus
UV	Ultra Violate
VDU	Visual Display Unit
VEE	Validation, Estimation & Editing
VIP	Virtual Internet Protocol
VoIP	Voice over Internet Protocol
VRLA	Valve Regulated Lead Acid
VSAT	Very Small Aperture Terminal
WAN	Wide Area Network
XML	Extensible Markup Language