SubImplementing Partners' personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition.

(d) In addition, the Implementing Partner, subject to the payment specified in GCC Sub-Clause 42.1.3, shall

(i) Deliver to the EESL the parts of the Facilities executed by the Implementing Partner up to the date of termination

(ii) to the extent legally possible, assign to the EESL all right, title and benefit of the Implementing Partner to the Facilities and to the Plant and Equipment as at the date of termination, and, as may be required by the EESL, in any subcontracts concluded between the Implementing Partner and its SubImplementing Partners

(iii) deliver to the EESL all non-proprietary drawings, specifications and other documents prepared by the Implementing Partner or its SubImplementing Partners as at the date of termination in connection with the Facilities.

42.1.3 In the event of termination of the Contract under GCC Sub-Clause 42.1.1, the EESL shall pay to the Implementing Partner the following amounts:

(a) the Contract Price, properly attributable to the parts of the Facilities executed by the Implementing Partner as of the date of termination
(b) the costs reasonably incurred by the Implementing Partner in the removal of the Implementing Partner's Equipment from the Site and in the repatriation of the Implementing Partner's and its SubImplementing Partners' personnel.

(c) any amounts to be paid by the Implementing Partner to its SubImplementing Partners in connection with the termination of any subcontracts, including any cancellation charges.

(d) costs incurred by the Implementing Partner in protecting the Facilities and leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 42.1.2

(e) the cost of satisfying all other obligations, commitments and claims that the Implementing Partner may in good faith have undertaken with third parties in connection with the Contract and that are not covered by paragraphs (a) through (d) above.

42.2 **Termination for Contractor orImplementing Partner's Default**

42.2.1 The EESL, without prejudice to any other rights or remedies it may possess, may terminate the Contract forthwith in the following circumstances by giving a notice of termination and its reasons therefor to the Implementing Partner, referring to this GCC Sub-Clause 42.2:

(a) if the Implementing Partner becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, if the Implementing Partner is a corporation, a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the Implementing Partner takes or suffers any other analogous action in consequence of debt.

(b) if the Implementing Partner assigns or transfers the Contract or any right or interest therein in violation of the provision of GCC Clause 43 (Assignment).

(c) if the Implementing Partner, in the judgement of the EESL has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this Sub-Clause:

"corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution.

"fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the EESL and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the EESL of the benefits of free and open competition.

42.2.2 If the Implementing Partner

(a) has abandoned or repudiated the Contract

(b) has without valid reason failed to commence work on the Facilities promptly or has suspended (other than pursuant to GCC Sub-Clause 41.2) the progress of Contract performance for more than twenty-eight (28) days after receiving a written instruction from the EESL to proceed

(c) persistently fails to execute the Contract in accordance with the Contract or persistently neglects to carry out its obligations under the Contract without just cause

(d) refuses or is unable to provide sufficient materials, services or labor to execute and complete the Facilities in the manner specified in the program furnished under GCC Clause 18 (Program of Performance) at rates of progress that give reasonable assurance to the EESL that the Implementing Partner can attain Completion of the Facilities by the Time for Completion as extended

then the EESL may, without prejudice to any other rights it may possess under the Contract, give a notice to the Implementing Partner stating the nature of the default and requiring the Implementing Partner to remedy the same. If the Implementing Partner fails to remedy or to take steps to remedy the same within fourteen (14) days of its receipt of such notice, then the EESL may terminate the Contract forthwith by giving a notice of termination to the Implementing Partner that refers to this GCC Sub-Clause 42.2.

42.2.3 Upon receipt of the notice of termination under GCC Sub-Clauses 42.2.1 or 42.2.2, the Implementing Partner shall, either immediately or upon such date as is specified in the notice of termination,

cease all further work, except for such work as the EESL may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

(a) terminate all subcontracts, except those to be assigned to the EESL pursuant to paragraph (d) below
(b) deliver to the EESL the parts of the Facilities executed by the Implementing Partner up to the date of termination.
(c) to the extent legally possible, assign to the EESL all right, title and benefit of the Implementing Partner to the Works. and to the Plant and Equipment as at the date of termination, and, as may be required by the EESL, in any subcontracts concluded between the Implementing Partner and its SubImplementing Partners.
(d) deliver to the EESL all drawings, specifications and other documents prepared by the Implementing Partner or its SubImplementing Partners as at the date of termination in connection with the Facilities.

42.2.4 The EESL may enter upon the Site, expel the Implementing Partner, and complete the Facilities itself or by employing any third party. The EESL may, to the exclusion of any right of the Implementing Partner over the same, take over and use with the payment of a fair rental rate to the Implementing Partner, with all the maintenance costs to the account of the EESL and with an indemnification by the EESL for all liability including damage or injury to persons arising out of the EESL's use of such equipment, any Implementing Partner's Equipment owned by the Implementing Partner and on the Site in connection with the Facilities for such reasonable period as the EESL considers expedient for the supply and installation of the Facilities.

Upon completion of the Facilities or at such earlier date as the EESL thinks appropriate, the EESL shall give notice to the Implementing Partner that such Implementing Partner's Equipment will be returned to the Implementing Partner at or near the Site and shall return such Implementing Partner's Equipment to the Implementing Partner in accordance with such notice. The Implementing Partner shall thereafter without delay and at its cost remove or arrange removal

of the same from the Site.

42.2.5 Subject to GCC Sub-Clause 42.2.6, the Implementing Partner shall be entitled to be paid the Contract Price attributable to the Facilities executed as at the date of termination, the value of any unused or partially used Plant and Equipment on the Site, and the costs, if any, incurred in protecting the Facilities and in leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Sub-Clause 42.2.3. Any sums due to the EESL from the Implementing Partner accruing prior to the date of termination shall be deducted from the amount to be paid to the Implementing Partner under this Contract.

42.2.6 If the EESL completes the Facilities, the cost of completing the Facilities by the EESL shall be determined.

If the sum that the Implementing Partner is entitled to be paid, pursuant to GCC Sub-Clause 42.2.5, plus the reasonable costs incurred by the EESL in completing the Facilities, exceeds the Contract Price, the Implementing Partner shall be liable for such excess.

If such excess is greater than the sums due to the Implementing Partner under GCC Sub-Clause 42.2.5, the Implementing Partner shall pay the balance to the EESL, and if such excess is less than the sums due to the Implementing Partner under GCC Sub-Clause 42.2.5, the EESL shall pay the balance to the Implementing Partner.

The EESL and the Implementing Partner shall agree, in writing, on the computation described above and the manner in which any sums shall be paid.

42.3 **Termination by Contractor or Implementing Partner**

42.3.1 If

(a) the EESL has failed to pay the Implementing Partner any sum due under the Contract within the specified period, has failed to approve any invoice or supporting documents without just cause pursuant to Appendix 1 (Terms and Procedures of Payment) of the Contract Agreement, or commits a substantial breach of the Contract, the Implementing Partner may give a notice to the EESL that requires payment of such sum, requires approval of such invoice or supporting documents, or specifies the breach and requires the EESL to remedy the same, as the case may be. If the EESL fails to pay such sum, fails to approve such invoice or supporting documents or give its reasons for withholding such approval, fails to remedy the breach or take steps to remedy the breach within fourteen (14) days after receipt of the Implementing Partner's notice, or

(b) the Implementing Partner is unable to carry out any of its obligations under the Contract for any reason attributable to the EESL, including but not limited to the EESL's failure to provide possession of or access to the Site or other areas or failure to obtain any governmental permit necessary for the execution and/or completion of the Facilities which the EESL is required to obtain as per provision of the Contract or as per relevant applicable laws of the country, then the Implementing Partner may give a notice to the EESL thereof, and if the EESL has failed to pay the outstanding sum, to approve the invoice or supporting documents, to give its reasons for withholding such approval, or to remedy the breach within twenty-eight (28) days of such notice, or if the Implementing Partner is still unable to carry out any of its obligations under the Contract for any reason attributable to the EESL within twenty-eight (28) days of the said notice, the Implementing Partner may by a further notice to the EESL referring to this GCC Sub-Clause 42.3.1, forthwith terminate the Contract.

42.3.2 The Implementing Partner may terminate the Contract forthwith by giving a notice to the EESL to that effect, referring to this GCC Sub-Clause 42.3.2, if the EESL becomes bankrupt or insolvent, has a receiving order issued against it, compounds with its creditors, or, being a corporation, if a resolution is passed or order is made for its winding up (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), a receiver is appointed over any part of its undertaking or assets, or if the EESL takes or suffers any other analogous action in consequence of debt.

42.3.3 If the Contract is terminated under GCC Sub-Clauses 42.3.1 or 42.3.2, then the Implementing Partner shall immediately

(a) cease all further work, except for such work as may be necessary for the purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition

(b) terminate all subcontracts, except those to be assigned to the EESL pursuant to paragraph (d)(ii)

(c) remove all Implementing Partner's Equipment from the Site and repatriate the Implementing Partner's and its SubImplementing Partner's personnel from the Site

(d) In addition, the Implementing Partner, subject to the payment specified in GCC Sub-Clause 42.3.4, shall

(i) deliver to the EESL the parts of the Facilitiesexecuted by the Implementing Partner up to the date of termination

(ii) to the extent legally possible, assign to the EESLall right, title and benefit of the Implementing Partner to the Facilities and to the Plant and Equipment as of thedate of termination, and, as may be required by the EESL, in any subcontracts concluded betweenthe Implementing Partner and its SubImplementing Partners

(iii) deliver to the EESL all drawings, specifications and other documents prepared by the Implementing Partner or its SubImplementing Partners as of the date of termination in connection with the Facilities.

42.3.4 If the Contract is terminated under GCC Sub-Clauses 42.3.1 or42.3.2, the EESL shall pay to the Implementing Partner all paymentsspecified in GCC Sub-Clause 42.1.3, and reasonablecompensation for all loss or damage sustained by the Implementing Partnerarising out of, in connection with or in consequence of suchtermination.

42.3.5 Termination by the Implementing Partner pursuant to this GCC Sub-Clause 42.3 is without prejudice to any other rights or remedies of the Implementing Partner that may be exercised in lieu of or in addition to rights conferred by GCC Sub-Clause 42.3.

42.4 In this GCC Clause 42, the expression "Facilities executed" shall include all work executed, Installation Services provided, any or all Plant and Equipment acquired (or subject to a legally binding obligation to purchase by the Implementing Partner and used or intended to be used for the purpose of the Facilities, up to and including the date of termination.

42.5 In this GCC Clause 42, in calculating any monies due from the EESL to the Implementing Partner, account shall be taken of any sum previously paid by the EESL to the Implementing Partner under the Contract, including any advance payment paid pursuant to Appendix 1 (Terms and Procedures of Payment) to the Contract Agreement.

43. **Assignment**

43.1 The Implementing Partner shall not, without the express prior written consent of theEESL, assign to any third party the Contract or any part thereof, orany right, benefit, obligation or interest therein or thereunder, except thatthe Implementing Partner shall be entitled to assign either absolutely or by way ofcharge any monies due and payable to it or that may become due andpayable to it under the Contract.

44. Bankruptcy

If the Contractor shall become bankrupt or have a receiving order made against him or compound with his creditors, or being a corporation commence to be wound up, not being a voluntary winding up for the purpose only of amalgamation
/ reconstruction, or carry on its business under a receiver for the benefit of its creditors or any of them, the Owner ill be at liberty :

to terminate the contract forthwith by notice in writing to the liquidator or receiver or to any person in whom the contract may become vested & to act in the manner provided in GCC clause 42 entitled "Termination" as though the last mentioned notice has been the notice referred to in such clause and the equipment and materials have been taken out of the contractor's hands.

to give such liquidator, receiver or other person, the option of carrying out the contract subject to his providing a guarantee, for the due and faithful performance of the contract up to an amount to be determined by the Owner.

45. Contractor Performance & Feedback and Evaluation System

The Employer has in place an established 'Contractor Performance & Feedback System' against which the contractors performance during the execution of contract shall be evaluated on a continuous basis at regular intervals. In case the performance of the contractor is found unsatisfactory on any of the following four parameters, the contractor shall be considered ineligible for participating in future tenders for a period as may be decided by the Employer.
Financial Status

Project Execution & Project Management Capability

Engineering & QA Capability

Claims & Disputes.

46. Fraud Prevention Policy

The contractor along with their associate/collaborator/sub-contractors/sub-vendors/ consultants/service providers shall strictly adhere to the Fraud Prevention Policy of EESL displayed on its tender website www.eeslindia.org

The Contractor alongwith their associate/collaborator/sub-contractors/sub-vendors/ consultants/service providers shall observe the highest standard of ethics and shall not indulge or allow anybody else working in their organisation to indulge in fraudulent activities during execution of the contract. The contractor shall immediately apprise the Employer about any fraud or suspected fraud as soon as it comes to their notice.

SECTION-4

Scope of Supplies/Work, Qualifying Requirements, Terms & Conditions, Technical Specifications & Special Conditions of Contract

NOTE: ***THE TERMS & CONDITIONS STIPULATED HEREIN (I.E., IN SECTION-4) WILL SUPERSEDE ANY CONTRADICTORY/SIMILAR/OVERLAPPING TERMS & CONDITIONS IN ANY OTHER SECTION/PART OF THE TENDER***.

PART-A: General Information

Name of the Work: *Procurement of 23,50,000 Nos. Smart Meters for {Design, Manufacture, on-site Supply and Maintenance Support for 23,50,000 Nos. 4G/3G/2G (able to operate on all modes) based smart electricity meters in India*}

NIT/Bid Document No.: EESL/06/ICB-Smart Meter/Pan India/202109001 Dated. 01-09-2020.

BIDS ARE TO BE SUBMITTED AS FOLLOWS: -
(*Please note that, EESL has switched the tender system into E-tendering. Bidders shall submit their bid accordingly as per the terms and conditions of E-tendering mode.*)

Envelope 1 (Pre-Qualifying documents) should contain following:

1. Bid document fee in the form of Banker's Cheque/ Demand Draft drawn in favour of "Energy Efficiency Services Limited" payable at New Delhi. **(To be submitted in hard copy / manually in the tender-box on and before Technical E-Bid Opening Date and Time. Scanned Copy to be uploaded at E-tendering portal.)**

2. Bid Security Fee/Earnest Money Deposit as Attachment-2 by Banker's Cheque /Demand Draft drawn in favor of "Energy Efficiency Services Limited" or in the form of Bank Guarantee as per prescribed format in section 6. **(To be submitted in hard copy/manually in the tender-box on and before Technical E-Bid Opening Date & Time. Scanned Copy to be uploaded at E-tendering portal).**

3. Letter of the bidder submitting the bid in the form as stipulated in the bid document i.e., as per Bid Form as Attachment-1 of section - 6, Forms & Procedures. **(Scanned Copy to be uploaded at E-tendering portal).**

4. Power of attorney to sign the bid on Stamp Paper as Attachment-3 of section 6, Forms & Procedure. Bidders to use their own format. **(Scanned Copy to be uploaded at E-tendering portal).**

5. Certificate regarding acceptance of important terms and conditions as per ITB clause 4.6 as Attachment-4. Format enclosed in section 6. **(Scanned Copy to be uploaded at e-tendering portal).**

6. Form of acceptance of EESL fraud prevention policy and declaration as per Attachment- 7 of section 6, Forms & Procedure. **(Scanned Copy to be uploaded at E-tendering portal).**

7. NEFT/RTGS Bank details as per Attachment-10 of section-6, forms and procedure. **(Scanned Copy to be uploaded at E-tendering portal).**

8. Self-Declaration for not been blacklisted by Central/State/UT Government or any Public sector entities duly signed and stamped at company's Letter Head. **(Scanned Copy to be uploaded at E-tendering portal)**.

9. Declaration for Quoted Nos. of Smart Meters as per **Attachment 11** of section - 6, Forms & Procedure.

10. Duly Filled **Compliance Matrix/ CHECK – LIST FOR BIDDERS** as per **attachment 12** of section - 6, Forms & Procedure.

11. CERTFICATE REGARDING DECLARATION OF LOCAL CONTENT (As per attachment 13 of the tender document)

12. **Self-Declaration duly signed and stamped at company's Letter Head for not being under debar list/undergoing debarment period on account of breach of the code of integrity under Rule 175(1)(i)(h) of the General Financial rules for giving false declarations of local content. (Scanned Copy to be uploaded at E-tendering portal. Bidder shall clearly mention tender reference number and date of signing the self-declaration.**

13. **Certificate Regarding Compliance of Meity Notification Vide File No. 1(10)/2017-Cles Dt. 02.07.18 as per Attachment-14 of Section-6, Forms & amp; procedures Duly filled Signed by authorized signatory (Scanned Copy to be uploaded at E-tendering portal).**

Envelope 2 - Should contain following (Scanned Copy to be uploaded at E-tendering portal):

1. GST Registration Certificate and PAN Card Copy.
2. Deviation Statement as per the format at Attachment-5 of Section-6**.**
   Bids containing material deviations from or reservation to the terms and conditions and specifications mentioned in the Tender will be treated as non-responsive and will not be considered further.
3. One complete set of RfP documents and subsequent amendments (if any) duly signed and stamped on each page.
4. Implementation Partner(s) must mandatorily submit BIS certificate for Single Phase (10-60 A) and Three Phase (10-60 A) type of meters as asked in this Tender as per IS:16444 (Part-1) at the time Bid Submission. BIS should on the name of Implementation Partner. However, for LTCT Three Phase, implementation partner should submit the proof of application made to BIS at the Bid submission

Envelope 3 (Price Bid -to be filled up online only):

Since the bids are to be submitted through E-tendering mode, the prices are to be filled on e-tender portal only and bidders are requested not to submit the price bid in hard copy at EESL along with the documents. **The same will not be entertained. Any loss of information on account of this shall be sole responsibility of bidder.**

Price Bid Sheet Format (Table-A) is prescribed in the Tender document – only for illustration purpose **(prices are to be filled on E-tender portal only).**

<u>Opening & Further Processing of the Bids</u>

Signature :-
Subject : CN=PRASHANT KUMAR, ST=DELHI, OID.2.5.4.17=110003, OU=SUPPLY CHAIN MANAGEMENT, O=ENERGY EFFICIENCY SERVICES LIMITED, C=IN
User ID : p.kumar
Serial No : 11D14A5

Initially, Envelope–I containing the documents (as stated above) will be opened electronically. Envelope-II will be opened electronically on the same day of only those bidder(s), who have submitted EMD and requisite documents in Envelope-I.

Documents found in Envelope-II shall be scrutinized by EESL.

Envelope-III (Price Bid) shall be opened electronically subsequently, subject to acceptance of the documents submitted under Envelope- II. Price Bid opening date will be intimated to only those bidder(s), who are found suitable.

Price-Bid of the disqualified bidder(s) will not be opened and the EMD submitted by them shall be returned on approval of the Competent Authority.

The opened Price Bids shall be evaluated as per the criteria set out in the Tender and the award(s) of Contract shall be recommended accordingly. EMD of the unsuccessful bidder(s) shall be returned after receiving approval of the Competent Authority for award of Contract(s). EMD of the successful bidder(s) shall be returned only on receipt of the CPG by EESL as per the provision of the LOA/Contract (as the case may be).

Note: - Unorganized/Un-labelled Bids are liable to be rejected. Bidder to enclose an index of pages with proper nomenclature for each document enclosed and inserted page number on the documents to be submitted online at E-tendering portal

For and on behalf of EESL

*****

Signature :-
Subject : CN=PRASHANT KUMAR, ST=DELHI, OID.2.5.4.17=110003, OU=SUPPLY CHAIN MANAGEMENT, O=ENERGY EFFICIENCY SERVICES LIMITED, C=IN
User ID : p.kumar
Serial No : 11D14A5

PART-B: Scope of Supplies/Work and Qualifying Requirements

1. INTRODUCTION TO ENERGY EFFICIENCY SERVICES LIMITED

A joint venture of NTPC Limited, Power Finance Corporation, Rural Electrification Corporation and POWERGRID, Energy Efficiency Services Limited (EESL) was set up under Ministry of Power to facilitate implementation of energy efficiency projects. EESL is an Energy Service Company (ESCO) that seeks to unlock energy efficiency market in India, estimated to at US$ 12 billion that can potentially result in energy savings of up to 20 per cent of current consumption, by way of innovative business and implementation models.

Till date, EESL, through their flagship programmes UJALA and Street Lighting National Programme annually saves over $ 900 million. EESL has successfully distributed over 366 million LED bulbs and has retrofitted over 1.1 Billion LED street lights across India. It also acts as the resource center for capacity building of State DISCOMs, ERCs, SDAs, upcoming ESCOs, financial institutions, etc. EESL is the one-stop turnkey destination to implement energy efficiency for public utilities and corporates at your commercial offices, hospitality and Hotels etc.

Objectives of EESL:

a. To carry out and promote the business of Energy Efficiency and climate change including manufacture and supply of energy efficiency services and products.
b. To Provide consultancy services in the field of Clean Development Mechanism (CDM) projects, carbon markets, demand side management, energy efficiency, climate change and related areas.
c. To act as resource center in the field of Energy Efficiency and take up the activities of Capacity Building, Training and other related activities.
d. To carry out such other activities as offered by the Central Govt., Bureau of Energy Efficiency or any other agency related to Energy Efficiency and Climate Change

2. BACKGROUND & OBJECTIVE

The Indian power sector is the World's third largest power producer (371 GW installed capacity as on 30-Jun- 2020) and the fourth largest consumer of electricity. From being a totally state owned sector, the journey towards corporatization began in the late 1990's with increasing private participation starting with the generation sub-sector and spreading to the transmission and distribution sub-sectors. The integrated state utilities were unbundled to make separate generation, transmission and distribution entities in each state. There has also been significant legislation which supported this reform process and the strengthening of the regulatory commissions to oversee the activities of the power utilities.

Distribution is the most important link in the entire power sector value chain. As the only interface between utilities and consumers, it is the cash register for the entire sector. Post reforms of the 1990s, the Distribution sub- sector is till date dominated by state owned utilities which together control more than 95% of the consumer base. One of the key issue troubling these state utilities is financial viability due to the accumulated losses and continuing performance issues contributing to an average Aggregated Technical and Commercial Loss in excess of 22%.

The central government has supported the distribution sector through several schemes such as Financial Restructuring Packages and several other schemes which have worked to improve the

operational performance of the distribution utilities. In 2001, the government had launched the Accelerated Power Development and Reform Programme (APRDP) program to bring down the AT&C losses of Discoms by providing them grants to upgrade their transmission infrastructure. In 2008, the government restructured this scheme and launched it as Restructured Accelerated Power Development and Reforms Programme (R-APDRP). Funds were set aside for states to improve the distribution infrastructure and IT enablement. A strong, efficient and robust distribution system is crucial for providing 24x7 affordable power for all in India.

The central government has also launched the following schemes for the distribution sector:

a) IPDS (Integrated Power Development Scheme) is the next iteration of R-APDRP scheme which means to extend the coverage of IT infrastructure to larger areas in the country.
b) DDUGJY Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) focuses on feeder separation for rural households and agricultural purpose.
c) UDAY (Ujwal Discom Assurance Yojana) is a debt restructuring plan for Discoms with financial assistance tied to achievement of specified outputs such as AT&C loss reduction, coal rationalisation, Smart metering etc.

Smart metering and Smart Grid development in India is driven primarily through the National Smart Grid Mission (NSGM) which was established to plan and monitor the implementation of policies and programmes related to Smart Grid activities in India. There are over 14 smart grid pilots in various stages of implementation across the country which is being monitored by NSGM

In September 2016, the Central Electricity Authority (CEA) released a report on strategy for roll out of smart meters by state/union territories. In August 2015, BIS published the new smart meter standards "IS 16444: AC Static direct connected watthour smart meter- Class 1 and 2 specifications", was revised and published as IS 15959: Part 2- Smart meter in March 2016.

With the pilots and standards in place the stage has been set to scale up the roll-out of smart meters in India.

2.1 Objective of the Project

The Central government has identified smart meters as one of the lynchpins on which the IT infrastructure would be utilized. To meet this objective, Energy Efficiency Services Limited (EESL) seeks to procure smart meters by aggregating the demand from various states and disseminating them to the respective distribution utility.

EESL's ESCO led approach (BOOT Model): The ESCO business model for the project overall includes the following:

i) Implementation of AMI solution (Smart Meters, Communication, HES, Analytics, Cyber security, MDM and associated integration, Back End requirements, O&M during project period)
ii) Set up require backend hardware and integration of AMI meters to the AMI system and also to the legacy system of the utilities
iii) Create a sustainable impact by increasing utility revenues. Hence, some of the priority focus areas are increasing the billing efficiency, increase in customer satisfaction etc.

3. BILL OF QUANTITY

The bill of quantity has been mentioned in Table 1 below.

Table 1 - Bill of Quantity

S. No.	Item Name	Unit	Quantity
1.	Single Phase Smart Meters (including communications module)	Numbers	16,45,000
2.	Meter Box for Single Phase Smart Meters (Inclusive of All Necessary Accessories)	Numbers	16,45,000
3.	Three Phase Whole Current Smart Meters (including communications module)	Numbers	6,81,500
4.	Meter Box for Three Phase whole current Smart Meters (Inclusive of All Necessary Accessories)	Numbers	6,81,500
5.	LT-CT Operated Three Phase Smart Meters (including communications module)	Numbers	23,500
6.	Meter Box for LT-CT operated Three Phase Smart Meters (Inclusive of All Necessary Accessories)	Numbers	23,500

Bidder(s) shall refer to the Clause 11 of Special Conditions of Contract (SCC) for details on quantity variation.

4. SCOPE OF SUPPLIES/WORK& PROJECT EXECUTION

4.1 Project Scope

EESL intends to procure 23,50,000 nos. smart electricity meters operating on GPRS-4G/3G/2G (able to operate on all modes) based communications for deployment various states in India.

The scope of the bidder(s) shall include **Designing, Engineering, Manufacturing, Testing, Inspection, Packing, Supply, Transportation & Insurance (till delivery at site), delivery to project site (locations shall be intimated later), unloading, handling and storage of single-phase, three-phase whole current and LT-CT operated three-phase smart meters, along with meter box..** The smart meters and meter box shall have the replacement warranty period of 5.5 years from the date of receipt or 5 years from the date of installation & commissioning whichever is earlier, along with operational/ service support post completion of the warranty period shall be 5 years from the end of warranty period

The functionality and specification of these smart meters (unless otherwise mentioned in this document) need to be in accordance with the following standards and/or regulations with latest amendments:

a) IS 16444 (Part 1): A.C. Static Direct Connected Watthour Smart Meter Class 1 and 2 – Specification (as attached in **ANNEX-B**)
b) IS 16444 (Part 2): A.C. Static Transformer Operated Watthour and Var-Hour Smart Meters, Class 0.2S, 0.5S and 1.0S (as attached in **ANNEX-B**)
c) CEA Regulations on "Installation and Operation of Meters', 2006 to be read in conjunction with amendments dated 04 June 2010 and 26 November 2014

d) Smart meter specifications as mentioned in CEA Guidelines on "Functional Requirements of Advanced Metering Infrastructure (AMI) in India" issued in August 2016 (as attached in **ANNEX-C**).

e) The bidder(s) shall adhere to the clauses related to smart meter functionality and specification as per IS 16444 part-1 and Part-2 with all latest amendments.

This is to clarify that the successful bidder(s) owns the responsibility for meters to comply with all the requirements captured in the above-mentioned standards and/or regulations. It is assumed that bidder(s) submitting its response to this tender is prepared to comply with the above-mentioned standards / regulations. The smart meters before delivery, should be type tested at as per IS: 16444 (Part 1 and Part 2) at a National Accreditation Board for Testing and Calibration Laboratories (NABL)-accredited laboratory or any International Laboratory Accreditation Cooperation (ILAC) accredited laboratories in the world. In case the successful bidder(s) fails to comply with these requirements, its order shall be cancelled and shall be blacklisted for at least 3 years by EESL from future tenders. This condition needs to be mandatorily agreed by the bidder(s).

In the event of the bidder(s) going bankrupt or issues which prevent the bidder(s) from fulfilling the obligations during the tenure of the contract, the bidder(s) must adhere to Escrow principles for ensuring seamless operation. Adherence to such an Escrow arrangement is a pre-condition of award of contract to implementation partner(s).

The desired functional and technical specifications of smart meters have been mentioned in the subsequent sections of this document. However, the intent is not to specify and capture all the aspects of design and installation associated with smart meters mentioned herein. It shall be the obligation of bidder(s) that all the systems, sub-systems and equipment's/devices shall conform in all respect to high standards of engineering, design and workmanship, and shall be capable of performing continuous commercial operation as per best industry standards.

If the GPRS technology becomes obsolete in the project duration and there are no service providers for the same, then EESL will take a suitable decision regarding up-gradation of meter hardware well in advance without any additional cost to the implementation partner(s).

4.2 High Level Solution Architecture and Technical Specification

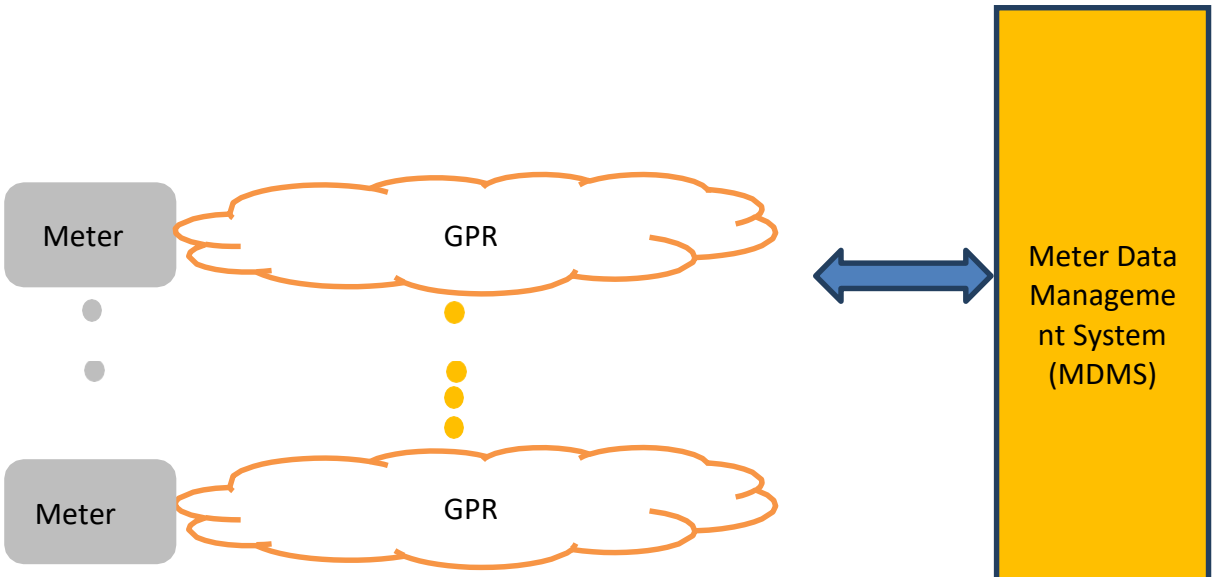
EESL on behalf of Utilities /Discoms in participating states intend to deploy smart meters in their service areas as per the high level solution architecture (cloud based) depicted in Figure 1. The smart meters supplied by the bidder(s) shall communicate with the Head End System (HES) using GPRS communications module operating in the frequency bands allocated by Government of India. The communications module shall be of pluggable-type and shall be capable of servicing technologies 4G/3G/2G ***(able to operate on all modes)*** technology compliant with IPv6.

Meter to support SMS facility which shall enable the following:

- Enabling of Smart Meters which gets disabled due to non-communication as it will help in doing RC/DC operations and sending meter reads over DLMS with minimum field interventions.

Data Push Facility

- To enable Smart Meters to send meter reads whenever GPRS signal is available.



*n: Number of smart meters to be deployed in a utility

Figure 1 - High Level Solution Architecture of Smart Metering for this Project

4.3 Smart Meter Functionalities

The smart meters shall have the following functionalities:

a) Remote meter data reading at configurable intervals(push/pull)
b) Time of ToU metering
c) Pre paid functionality
d) Net Metering/Billing
e) Alarm/Event detection, notification and reporting
f) Remote load limiter and connection/ disconnection at defined/on demand conditions
g) Remote firmware upgrade

4.4 Integration requirements with implementation partner(s) of subsequent tender of other components of AMI

AMI typically comprises of three key components, namely, meters, communications and information technology. In order to service the complete AMI solution, roll-out EESL issue the tenders as described below.

The first tender (this document) is for the turnkey project for smart meters. Subsequent turnkey tender(s) will shortlist / determine the communication provider and system integrator(s). Given the roll-out volume, the selected smart meter winning bidder(s) may need to work with multiple communication provider(s) / System Integrator(s) and vice-versa. Implementation partner(s) of this tender need to seamlessly integrate with the communication(s)/ system integrator(s) selected in the subsequent tenders with following integration requirements:

a) Implementation Partner(s) must share the meter security keys, all level encryption, password information along with asset information in a format (to be specified after system integrator is appointed) with the system integrator so that during AMI business flows the device and data can be authenticated all the time.
b) Implementation Partner(s) must share the details of meter communication specifically programmed protocols.
c) Implementation Partner (s) must share the meter interface touch points for external applications/ systems.

d) Implementation Partner(s) must share the required APIs including but not limited to reading APIs, configuration APIs and Functional APIs with the System Integrator for execution of business flows. (Installation, reading, configuration).
e) Implementation Partner(s) must share the data storage and retrieval details.
f) Implementation Partner(s) must share the warranty information of all AMI meters to the system integrator for asset management purpose.
g) Implementation Partner(s) must configure the devices to be upgraded remotely (OTA) when it is required in case of feature request or fault correction.
h) Implementation Partner(s) must follow and conduct Utility's sample and periodic test program, including (but not limited to) the selection of a sample population of meters, sharing of sample test results as reported by the meter testing systems with the system Integrator.
i) Implementation Partner(s) must share the information related to communication module for the authorization purpose at system integrator end.

4.5 Meter Service Level Agreement (SLA)

a) The Bidder(s) shall ensure that all information security aspects are exercised tested, implemented and where necessary enhanced not diluted at any point of time.
b) Meter shall record precisely all the incidences and metering parameters required as per specifications.

The SLA for meters is mentioned in Table 2.

Note: The SLA for meter manufacturer is contingent upon EESL providing appropriate network for communication as well as system integration. Penalties on not adhering to SLA will be subject to EESL making available proper communication network connectivity and system integration. For instance, if out of the total number of meters supplied in a particular month, x% of them are not able to function properly due to lack of communication network or system integration, penalties on meter manufacturers will not apply on these x% of meters supplied

Table 2– SLA for Meters

S. No.	Defined Parameter	Service Level requirement	Validation Procedure	Penalty
1	Meter Failure Rate: Failure is defined as any occurrence when the equipment is not functioning per design specification.)	Less than 1.5% failure rate per annum for all kind of energy meter over the required guarantee period.	Identification of defective meters in the backend system	1.5-3%: 2% penalty on the Warranty period charges on yearly basis , 3– 5%: 5% penalty on the Warranty period charges on yearly basis Beyond 5%: 10% penalty on the Warranty period charges on yearly basis

2	Non-returnable buffer Stock: sufficient stock of meter shall be ensured by the meter manufacturers for warrantee replacement of faulty meters within 24 hours	0.5% of supplied energy meters	Availability of buffer meter stock in warehouse	Below 0.5%: 10% penalty on the buffer meter cost
3	Replacement of faulty Meters: faulty meter to be replaced (under warranty only) by the bidder(s) and refurbishment of faulty meters	Two weeks for 90% refurbishment of faulty meters . Three weeks for 100% refurbishment of faulty meters	Intimation to Meter manufacturer	95-99.5%: 2% penalty on the Warranty period charges on yearly basis 90% - 95%: 5% penalty on the Warranty period charges on yearly basis Below 90%: 10% penalty on the warranty period charges on yearly basis
4	Firmware support: Meter manufacturer shall provide respective firmware in case of a malfunctioning or a feature request at no extra cost to EESL/utility (The proposed firmware update will be deployed after successful UAT of the same)	100% within 30 days	Date of written request by System Integrator	1% penalty on the Warranty period charges on yearly basis

4.6 Quality Control / Inspection by EESL

i) The Implementing partner shall be given QAP assurance Plan to EESL after Acceptance of LoA.

ii) The implementing partner shall be wholly responsible for the quality and performance of the supplied smart meters as per the tendered technical specifications.

iii) EESL reserves the right to visit the manufacturing site or the supply chain for quality inspection at any time. EESL at its discretion may order the testing of random samples from an independent third party NABL/ILAC-accredited testing Laboratory for which the cost of 3 such tests shall be borne by the implementation partner(s) .The cost of additional nos. of tests shall be borne by EESL .The meter box shall also be subject to appropriate tests to ensure compliance towards tendered specification.

iv) After testing, if the smart meter is found not matching the specifications at given test parameters, EESL at its discretion may order for cancellation of complete order or cancellation of the complete lot of product. The complete loss shall be to the account of the supplier.

v) The items will be supplied in proper packing (as per relevant IS, if any) to avoid any damage during transit, storage and delivery. The implementation partner shall be responsible to transport and insure the smart meters till their delivery at project site (locations shall be intimated later).

vi) Inspection / Checking / Testing:

I. Inspection

All materials/equipment manufactured by the implementation partner against the Letter of Award (LOA) shall be subject to inspection, check and/or test by the EESL or its authorized representative at all stages and place, before, during and after the manufacture.

If upon delivery, the material / equipment does not meet the specifications, the material / equipment shall be rejected and returned to the supplier for repairs / modification, etc. or for replacement. In such cases, all expenses including the to-and-fro freight, repacking charges, any other costs, etc. shall be to the account of the implementation partner.

All tests shall be carried out as per IS 16444, and the implementation partner shall submit the relevant test reports.

II. Tests

The implementation partner needs to get the samples for the first lot to be type-tested under EESL supervision at an NABL/ILAC-accredited Third Party Laboratory. The samples for such tests would be identified by EESL and cost of the sample and shipping shall be borne by the implementation partner(s).

During the tender duration, EESL at implementation partner(s) cost shall conduct additional type tests at NABL-accredited (implementation partner(s)-owned/third party) laboratory to maintain check on the supplied product. The random sample for such tests would be identified by EESL and can be from the manufacturing/supply chain/ customer facility.

III. Pre-dispatch Tests

The implementation partner(s) shall maintain and provide statutory test certificates for each supplied batch, confirming compliance to the technical specifications and other tender/LOA requirements. EESL reserves the right to conduct third party inspection to assess acceptability of each lot at its own cost. Only those batched meeting compliance & cleared by EESL Engineer in-charge(EIC) shall be dispatched by the Implementation Partner(s).

4.7 Documentation along with supply of smart meters

The bidder(s) shall provide the following documents (both hard copy and soft copy) to EESL/System Integrator/Utility for reference:

a) Manual / Guide: User Manuals, FAQ, OEM Functional Manuals and Installation Guides, Business Process Guides and Troubleshooting Guides

b) Certificates: Meter Warranty, Insurance, NABL/ILAC meter test

The above mentioned documents shall be provided in the word format to provide flexibility for customization, if required.

4.8 Risk Mitigation

The implementing partner(s) is expected to work with project managers from communication/ system integrator/ utilities in the participating states for immediately resolving the following risks (non-exhaustive indicative list):

a) Inability to read meters
b) Poor network communication performance
c) Delay in information provided by the utility
d) Project scope creep
e) Unavailability of internal and external resources
f) Rectification of meter faults as per agreed SLAs

4.9 Specific Exclusions (to be covered under separate tender)

The following are excluded from this project:

a) Installation and commissioning of smart meters
b) Installation of Head End System (HES)
c) Installation of Meter Data Management System (MDMS)
d) Integration of HES and MDMS

4.10 Roles and Responsibilities of Stakeholders

The success of the AMI solution would require synergistic action from all key stakeholders. While EESL and DISCOM shall have a set of binding Service level Agreements (SLAs) commitments to adhere to there would be additional expected roles and responsibilities of key entities involved as mentioned below *inter-alia*.

4.10.1 Utility/DISCOM

a) DISCOM shall provide database of consumers and assets as well as periodic updation information.
b) DISCOM has the license for distributor of electricity in the project area, and is responsible for the supply, distribution and sale of electricity, operations and maintenance of the electrical Metering in these areas.
c) DISCOM shall sign an Agreement with EESL to implement AMI in the project area.
d) DISCOM shall work in close coordination with EESL and fulfil its obligations under the Agreement with EESL.
e) DISCOM shall participate in the periodic review meetings as per the project governance structure, and shall support with the required interventions requested. DISCOM shall assign competent manpower to the Project Team. DISCOM shall cooperate with bidder(s) for the timely implementation of the AMI; and for its successful operation during the project period.
f) Support EESL to execute a successful consumer awareness campaign in the project area.

4.10.2 EESL (ESCO)

Note: EESL to carry out the SLAs may act through winning bidder(s) as necessary.

a) EESL shall open a warehouse for each project location so that the meters can be stored in that warehouse.
b) To provide effective redressal to the Consumer grievances and Complaints related to AMI in accordance with the Electricity Laws.
c) Undertake necessary installations for new connections / Replacement of defective Meters to ensure that supply of electricity is provided to the owner or occupier of any premises upon the receipt of application requiring such supply in accordance with the Electricity Supply Code, 2004 as in force from time to time.
d) To ensure the safety of the Smart meters and related other equipment.
e) To define a process to maintain rolling stock of meters and other necessary materials to meet the necessary standards of performance as per the orders and regulations of SERC.
f) To select System Integrator through a transparent public procurement method.
g) During the implementation of the project, EESL shall establish a governance mechanism to ensure that the execution progress is as planned.

4.10.3 Customer

a) The consumer shall allow access to System Integrator to install Smart meter at his/her premises/ pre- defined place.
b) The consumer shall lodge its complaint to the consumer grievance cell of DISCOM and DISCOM will forward all complaints to EESL related to AMI.

4.10.4 State Electricity Regulator / State Government

a) Issue the required enabling regulation/ guidelines related to the AMI project implementation in DISCOM jurisdiction under EESL initiative.

4.10.5 Representatives of Implementation Partners(s)

a) The representatives of bidder(s) shall be responsible for interacting with EESL and identified utilities for coordinating in case of meter replacement, issue handling etc.
b) The Project Director shall be based out of EESL office (location shall be intimated later) and shall be the single point of contact for the identified utilities and EESL
c) The Project Managers shall be based out of utility office (location shall be intimated later)
d) The field persons shall be based out of utility office (location shall be intimated later)
e) These officers are responsible for smooth coordination of the entire project. These officers shall be required to travel to field locations as and when required.
f) These officers shall liaison with other stakeholders such as system integrators, communication service providers etc. to ensure seamless implementation of the project.

4.11 Other Requirements to be provided by successful bidder:

S. No	Description	Other Requirements

1	Integration	Implementation Partner(s) must provide sample meters for Single Phase and Three Phase (as per requirement of EESL) to System Integrator within 2 weeks from date of LoA for integration of 4G/3G/2G (able to operate on all modes) meters with HES and provide necessary technical support as and when requested by EESL. Data Model will be provided to successful bidder(s) by EESL within 2 days from date of LoA.
2	CMRI and its software	Implementation Partner(s) must provide Common Meter Reading Instruments (CMRI) with pre-installed software (1 no. CMRI per 10,000 nos. of meters as per contractual quantity) to EESL along with necessary accessories for collection of manual meter readings at the site.
3	BCS	Implementation Partner(s) must provide 5 Licensed Base Computer Software per DISCOM.
4	Mobile App (Meter Reading Application)	Implementation Partner(s) must provide the mobile app (compatible with all standard Operating System including but not limited to Android/Windows/iOS etc.) for collection of meter reading from the meters along with supplies of first lot of meters. Total 100 software License (scalable) with USB Communication Cable (i.e. USB to Optical Port.) will be required. Meter data in XML format will be directly feed into MDM from the mobile application
5	Seals	Implementation Partner(s) must provide all the seals required for the meter and meter box etc. as per EESL requirement.
6	Antenna Strength	Meter internal antenna shall be omni-directional with 6 dBi signal strength, Antenna should have 50 ohm impedance. Antenna certificate to be shared with every supply. EESL will test the antenna on random basis and liable to be rejected by EESL if not found not as per specification.
7	Welding	Meters should be supplied with ultrasonic welding.

PART-C: SPECIAL CONDITIONS OF CONTRACT

1. SECURITY DEPOSIT / CONTRACT PERFORMANCE GUARANTEE

Within Twenty-Eight (28) days of the receipt of notification of award from EESL, the successful bidder shall furnish the CPG in the form of Demand Draft/ Pay Order or Bank Guarantee for 10% of contract value (exclusive of GST). The Bank Guarantee must be valid to cover Delivery Duration (09 Months) +Warranty & Service Support Duration (10 Years) + Three Months Claim Period. Any delay in submission of SD/CPG shall be deemed as accruing of financial benefit to the supplier and EESL may take necessary interest penalty recovery action (interest @ SBI's MCLR + 2 %) from the payments due to the supplier for the period of delay. However, this provision does not bind EESL in any way from proceeding against the supplier (including forfeiture of EMD, cancellation of the empanelment/LOA, etc.) for non-compliance towards non-submission of the SD/CPG.

In case Bidder provides CPG for shorter duration, it shall be for a minimum period of 3.5 years and EESL reserves right to invoke CPG in case extended CPG/fresh CPG is not furnished at least 90 days prior to expiry of original CPG.

Bank guarantee shall be from any Nationalized Banks/other scheduled private banks as per list given in Section 6. EESL shall at his discretion have recourse to the said Bank Guarantee for the recovery of any or all amount due from the bidder in connection with the contract including of guarantee obligations.

Failure of the Successful Bidder to comply with the requirements of IFB/RfP shall constitute sufficient grounds for the annulment of the award and forfeiture of the Contract Performance Guarantee.

This Bank Guarantee shall be effective only when BG issuance message is transmitted by issuing bank through SFMS to

IDFC Bank Ltd.
IFSC code: IDFB0020101
Branch Name: Soodh Birla Towers, Barakhamba Road new Delhi- 110001
The Message code to be used by the bank will be the following: -
Code Purpose
IFN 760 Confirmation of Bank Guarantee
IFN 767 Amendment in Bank Guarantee

2. TERMS OF PAYMENT

i) The payments for different cost heads/components shall be released to the bidder(s) as tabulated below, within 30 days of receipt of the bidder's Tax invoice at EESL office with all the requisite respective documents signed and stamped by EESL's EIC/authorized representative at designated delivery location. Each invoice shall have the Tax, etc. registration document's photocopy annexed to it.

ii) Bidder(s) needs to ensure completion of all works as per project plan before submitting the invoice. This includes supply of required Hardware and acceptance from the concern officer.

iii) In case of delay in project, the entire cost and/or time over-run shall be the responsibility of the bidder(s) and shall be borne by him only.

iv) Power to withhold: Notwithstanding anything contained in the payment schedule mentioned above, if in the opinion of the EESL, any work done or supply made or service rendered by bidder(s) is deficient in any manner in comparison to the prescribed standards, EESL shall be at liberty to withhold a reasonable portion of the payments due to the bidder(s), till such work/ supply/ service is made conforming to the prescribed standards. These powers to withhold payments shall be without prejudice to any other power/ right of the EESL under this contract.

v) All payments shall be made by EESL, no later than thirty (30) days after submission of an invoice and acceptance from the EESL, in favour of the Lead Consortium Member.

vi) The release of payments shall be progressive and performance/ output-based as per the given Payment Schedule, where the payments shall be made for measured deliverables and outputs on acceptance by EESL.

vii) If any excess payment has been made by EESL due to difference in quoted price in proposal and Contractor's invoice, EESL may without prejudice to its rights recover such amounts by other means after notifying the bidder(s) or deduct such excess payment from any payment subsequently falling due to the bidder(s).

viii) EESL reserves the right, as its sole discretion to waive any penalty being imposed on the bidder(s) in case the bidder(s) fails to meet milestones/agreed service level due to a valid reason beyond the control of bidder or upon EESL's request. Waiver shall be granted on merit and only as an exception by EESL/Utility Officials. Any Delay on Account of System Integrator (System Integrator selected though other RfP for providing MDMS/HES, Cloud etc.) not making the systems available and failure to install the meters would not be attributable to the bidder(s) and would not lead to imposing penalty on bidder(s), EESL may waive the penalty in such a scenario.

ix) EESL reserves the right, as its sole discretion to stagger the delivery of meters. any such action will be discussed with Bidder(s). Bidder(s) shall be informed of the same in writing. Penalty related to delivery of meter may be waived by EESL if cause of such delay is not in bidder's control or the delay is due to EESL request for staggered delivery. Penalty shall be adjusted in case EESL approves such waiver. Penalty recovered shall be adjusted in the subsequent payment and no interest shall be paid on this amount.

x) The payment shall be processed only upon receipt of (i) acceptance of LoA and signing of contract agreement; (ii) submission of CPG as per tender documents in addition to deliverable documents

At the time of payment of bills, the income tax, if any, shall be deducted at source as per Government rules and guidelines as may be prevailing at the time of payment.

The payment schedule for this project is mentioned in Table I.

Table I - Payment Schedule

Payment Milestone	**Payment Terms**	**Conditions**
Supply Phase	1. Payment of 100% of GST and 60% of invoice value (excluding GST) upon delivery of material at site / warehouse for the quantity supplied subject to following: a) Submission and acceptance of DLMS Compliance Matrix, APIs, Data Exchange information and Configuration Diagram, Test Procedures and Type test reports. b) Acceptance of purchase order. c) Submission of the necessary Contract Performance Bank Guarantee. d) PDI report and Material Delivery Clearance Certificate (MDCC)	Payment shall be released within 30 days after receipt of original monthly-raised Tax invoice at EESL for the supplies delivered, with receipt acknowledged, signed and stamped by EESL authorized representative at designated project location.
Integration and Commissioning Phase	1. 30% payment on Integration and commissioning of supplied smart meters with the AMI solution. This shall be released within 30 days after 3 months post successful integration of the targeted smart meters with the backend system. Report from MDMS shall be generated to confirm integration and commissioning of meters with HES and MDMS. 2. In case of delays in integration for which supplier is not responsible, then this 30% shall be released within 30 days after 06 months of supply provided that no major hardware failure was reported for other lots.	After demonstration of integration and successful execution of test cases and User Acceptance Test (UAT), a report from MDMS shall be generated to confirm integration and commissioning of meters with HES and

<table>
<tr><th>Payment Milestone</th><th>Payment Terms</th><th>Conditions</th></tr>
<tr><td></td><td></td><td>MDMS verified by EESL and DISCOM/Utility representative.</td></tr>
<tr><td>Warranty phase</td><td>3. Remaining 10% of the payment on submission of tax invoice after operational acceptance by EESL based on the performance, payment to be released as follows-
<table><tr><td>Year -1</td><td>2%</td></tr><tr><td>Year -2</td><td>2%</td></tr><tr><td>Year -3</td><td>2%</td></tr><tr><td>Year -4</td><td>2%</td></tr><tr><td>Year -5</td><td>2%</td></tr><tr><td>Total</td><td>10%</td></tr></table></td><td>SLA report / Duly signed performance report by EESL's Project in charge and DISCOM/Utility representative.

The year for this purpose shall be counted from the date of respective monthly invoices for supply.</td></tr>
</table>

The bidder(s) shall note the following:

1. The bidder(s) shall provide the following documents at the time of invoicing:
   i. Delivery Challan.
   ii. Goods Receipt Note (GRN).
   iii. Octroi Duty/Entry Tax paid receipt.
   iv. Batch Inspection Report.
   v. Copy of AMC Agreement Copy between the Bidder(s) and End User.
2. All documents to be duly certified by the EIC/representative, and by the End User/Customer Representative.
3. The payment shall be processed only after receipt of following: -
   i. Acceptance of LOA and signing of Contract Agreement.
   ii. Submission of Contract Performance Guarantee (CPG).
4. Interest shall not be paid on the bank guarantee submitted by bidder(s).

3. LIQUIDATED DAMAGES

For Delay in Supplies: In case of any delay by the bidder(s) beyond the stipulated schedule given at **Table-II**, including any extension permitted in writing, EESL reserves the right to recover from the bidder(s) a sum equivalent to 0.5 % of the value of the delayed supplies for delay per week or part thereof, subject to a maximum of 10 % of the total value of the contract.

Notwithstanding the above, in case of regular and repeated complaints against the bidder(s) and the bidder's failure in providing satisfactory after-sales replacement warranty and maintenance services, EESL reserves the right to forfeit the SD/CPG submitted against the LOA towards non-performance of the contract.

Alternatively, EESL reserves the right to purchase and distribute material from elsewhere at the sole risk at the cost of bidder(s) and to recover all such extra costs incurred by EESL in procuring the material from resources available including EMD/Bid Security/encashment of Bank Guarantee or any other sources, etc. Further, if any extra cost is incurred by EESL due to delay in work completion by the bidder(s) beyond the completion time as per PO, the same shall also be recovered from bidder's invoice/EMD/BGs, etc.

Alternatively, EESL may cancel the order completely or partly without prejudice to its right under the alternatives mentioned above.

4. PRICE BASIS

The prices/rates are inclusive of cost of finished product which includes the following:

a) Packaging and forwarding charges
b) Freight and transit insurance charges covering transportation upto EESL designated warehouse
c) Unloading at EESL designated warehouse
d) All applicable duties and taxes except GST (ISGT, CGST, SGST and UGST)

Prices once quoted shall remain firm, and shall not be subject to any escalation, till completion/execution of the contractual assignments/work and till the contract's validity extension, if any

5. Warranty:

The smart meters and meter box shall have the replacement warranty period of 5.5 years from the date of receipt or 5 years from the date of installation & commissioning whichever is earlier, along with operational/ service support post completion of the warranty period shall be 5 years from the end of warranty period.

6. EVALUATION CRITERION

- The price bids shall be evaluated as per the grand-total price of all BOQ items, i.e., the price at Total of Column 5 of the Price Bid Sheet format given at **Table-A**. The bidder(s) having the lowest total price, of the price bid shall be lowest evaluated bidder(s) (i.e., L-1).

- EESL intends to split the total order quantity among four Bidders. The allocation of quantity among bidders in case of order to be split other than L-1 (who matches the L-1 price) shall be split based on the price bid hierarchy, i.e. L2, L3 & L4 subject to matching the L-1 price for complete scope of work for each package. The award to L2, L3, L4 shall be subject to their acceptance of L1 rates with all other terms and conditions as per tender will be as follows: -

In case of Distribution between	Ratio in percentage
Two Parties (L1 : L2)	60% : 40%
Three Parties (L1 : L2 : L3)	50% : 30% : 20%
Four Parties (L1:L2:L3:L4)	40%:30%:20%:10%

- Further, in case a party is not able to supply quantity allocated to them as per scheduled timelines, EESL reserves the right to shift the part/full quantity to other bidder who has matched the price on the risk and cost of such non-performing bidder.

- In the event of tie in prices between two or more bidders, the bidder with higher turnover will be given preference in ranking & award. Avg. of last two financial years shall be considered for arriving at turnover for comparison in such cases to break the tie.

- It is mandatory to quote for all the items/services requisitioned in the Price Bid Sheet format. Non- compliant bids shall be liable for outright rejection.

- The illustrative format & notes for price bid shall be referred at **Table-A**.

Signature :-
Subject : CN=PRASHANT KUMAR, ST=DELHI, OID.2.5.4.17=110003, OU=SUPPLY CHAIN MANAGEMENT, O=ENERGY EFFICIENCY SERVICES LIMITED, C=IN

- If a bidder(s)has quoted for full quantity, it shall mean that the bidder(s) is obligated to deliver the entire quantity as per the delivery schedule and agreed terms and conditions.

- Minimum Quantity to be quoted against each item mentioned in Price bid Table in Section-4 is 40% of the Maximum Quantity against respective item.

7. <u>Action by EESL if L1 backs out:</u>

After opening of price bid, if L1 bidder backs out, the bidder will be put on holiday list of EESL for a period of one year. During this tenure, the bidder will be barred from participation in EESL tendering process. However, bidder has to continue the unexecuted work of the other prevailing work if any under the current running contracts. Simultaneously, the EMD submitted by such bidder against the subject tender will be forfeited. If bidder is exempted from submission of EMD, then the EMD amount will be adjusted from the payments due to the contractor against other running contracts. If there is no running contract of the bidder/ no payment dues of the bidder then EESL reserves the right to take any legal remedy as deemed fit to recover the penalty equivalent to EMD amount through legal means.

8. ADJUDICATOR

Adjudicator under the contract shall be appointed by the Appointing Authority i.e. MD (EESL). If the bidder(s) does not accept the Adjudicator proposed by EESL, it should so state in its bid form and make a counter proposal of an adjudicator. If on the day the contract agreement is signed, the EESL and contractor have not agreed on the appointment of adjudicator, the adjudicator shall be appointed, at the request of either party, by the appointing authority specified.

9. ARBITRATION

Arbitration shall be carried out as per Arbitration Act 1996 and its subsequent amendment. The Contract shall be governed by and interpreted in accordance with the laws in force in India. The courts of DELHI shall have exclusive jurisdiction in all matters arising under the contract.

10. Delivery conditions / Completion time :

Rates are valid for 09 Months after award of LoA.

Quantities will be allocated to the bidder through valid PO indicating shipping address. Bidder has to arrange supplies accordingly. PDI call shall be given by vendor after receipt of PO by EESL.

Entire material to be delivered, installed, tested and commissioned as follows:

(a) <u>Supply Schedule:</u>

- Entire PO (release order) quantity to be delivered within 30 days from the date of issuance of PO (release order), subject to the ceiling limit of 10000 Quantity. Delivery period will be proportionately get increased on pro-rata basis for the quantity above ceiling limit.

Note: The material shall be allocated from time to time by EESL through valid PO's (Release Orders) indicating the supply location and quantity. The supplier can improve upon the delivery schedule depending upon his capacity and production rate

Entire material to be delivered and jobs to be completed as per the delivery schedule from the date of issue of Purchase Order/Letter of Award

Table -2
Delivery and Completion Schedule

Item Name	Total meters to be supplied in 09 Months	Delivery Location
Single Phase Whole Current Smart Meters (including communications module) as per IS 16444 Part 1 with accuracy class 1 and current rating of 10-60 A	16,45,000	Bidder shall be fully liable to execute the supply at Locations across various states of India
Meter Box for Single Whole Phase Smart Meters (Inclusive of All Necessary Accessories)	16,45,000	
Three Phase Whole Current Smart Meters (including communications module) as per IS 16444 Part 1 with accuracy class 1 and current rating of 10-60A	6,81,500	
Meter Box for Three Phase whole current Smart Meters (Inclusive of All Necessary Accessories)	6,81,500	
LT-CT Operated Three Phase Smart Meters (including communications module)as per IS 16444 Part 2 with accuracy class 0.5S and current rating of -/5A	23,500	
Meter Box for LT-CT operated Three Phase Smart Meters (Inclusive of All Necessary Accessories)	23,500	
Grand Total	23,50,000	

Please note that:

a. Delivery needs to be uniformly done throughout the 09 Months on monthly pro-rata basis.
b. The above delivery schedule is indicative. EESL will provide the final delivery schedule at the time of award of contract.

10. The Bidder(s) shall be deemed to have examined the Bid document, to have obtained its own information in all matters whatsoever that might affect carrying out the Works in line with the Technical specifications and Scope of Work specified in the document at the offered rates and to have satisfied himself to the sufficiency of its Bid. The bidder(s) shall be deemed to know the scope, nature and magnitude of the work and requirement of materials, equipment, tools and labor involved, wage structures and as to what all works he has to complete in accordance with the Bid documents irrespective of any defects, omissions or errors that may be found in the Bid documents.

11. QUANTITY VARIATION

EESL reserves the right for quantity variation up to +/-20%. Further, EESL reserves the right to place a repeat order in case of urgency for part quantity in the Letter of Award for similar work on same prices, terms and conditions. Also, EESL reserve the right to ask the implementation partner(s) to deliver the part quantity placed on them anywhere in territory of India on same prices, terms and conditions. However, any such quantity variation/placement of Repeat Order shall need to be authorized through prior amendment of the LOA/issuance of fresh LOA to that effect.

12. INSURANCE

The Goods supplied under the Contract shall be fully insured in Indian Rupees against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery. For

delivery of goods at site, the insurance shall be obtained by the Contractor, for an amount not less than the Contract Price of the goods from "warehouse to warehouse" (final destinations) on "All Risks" basis including War risks and strikes.

13. TRANSPORTATION, DEMURRAGE WHARFAGE, ETC.

Implementation partner(s) is required under the Contract to transport the Goods to place of destination defined as Site. Transport to such place of destination in India including insurance, as shall be specified in the Contract, shall be arranged by the implementation partner(s), and the related cost shall be included in the Contract Price.

Implementation partner(s), on whom letter of award is placed, is to ensure all safety guidelines, rules and regulations, labour laws etc. Implementation partner(s) indemnify EESL for any accident, injury met by its labour, employee or any other person working for him. Any compensation sought by its labour, employee or any other person working for him shall be paid by implementation partner(s) as per settlement solely. EESL has no role to play in this matter.

14. INTERCHANGEABILITY OF PRODUCT

Implementation partner(s) is to submit interchangeability certificate for its product/components supplied for replacement during warranty and maintenance period and even when it is purchased from open market. In case due to change in technology, the supplied product is not available during warranty/ maintenance period, then the improved version of product can be used in warranty/maintenance period with same or improved technical parameters or the combination thereof after written communication of Engineer in Charge at same cost & terms and conditions.

15. ADHERENCE TO SPECIFICATIONS

Subsequent to an order being placed against your quotation, received in response to this 'enquiry', if it is found that the materials supplied are not of the right quality or not in accordance with our specifications (required by us) or received in damaged or broken conditions, not satisfactory owing to any reason of which we shall be the sole judge, we shall be entitled to reject the materials, cancel the contract and buy our requirement from the open market / other sources and recover the loss, if any, from the bidder(s) reserving to ourselves the right to forfeit the security

deposit, furnished by the bidder(s) against the contract. The bidder(s) shall make its own arrangements to remove the rejected material within a fortnight of instruction to do so.

Thereafter material shall lie entirely at the bidder's risk and responsibility and storage charges, along with any other charges applicable, shall be recoverable from the bidder(s) .

16. We reserve the right to accept or reject any quotation in full or in part without assigning any reason thereof. We also reserve the right to split and place order on more than one bidder.

17. The bidder(s) should not have been black-listed by Central/ State Government or Public Sector Undertakings. If at any stage of tendering process or during the currency of the contract, any suppression / falsification of such information is brought to the knowledge, EESL shall have the right to reject the proposal or terminate the contract, as the case may be, without any compensation to the tenderer & forfeiture of bid security/EMD/CPG.

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User ID : p.kumar
Serial No : 11D14A5

18. BID SECURITY/EARNEST MONEY DEPOSIT (EMD)

Amount & other details of Bid Security/EMD: **As mentioned in Section-1.**

The details of EMD instrument has to be submitted in relevant field/column of online module. Tenders without Earnest Money Deposit is liable to be rejected. It should be ensured by the vendor that the original BG is received by EESL before opening time of techno-commercial bids for verification of the details of BG given online by the vendors.

The tender submission, tender closing and opening will be done electronically and online.

EESL shall not be responsible for any delay, loss or non-receipt of Tender Document Cost sent by post/courier. The instrument should reach in original to EESL office before the Bid Opening date. Bids not accompanied with the requisite tender document cost may not be opened.

The bid securities of unsuccessful bidder(s) will be returned as promptly as possible after the award is made.
The bid security of the successful bidder(s) will be returned when it has signed the contract agreement, and has furnished the required performance security.
The bid security may be forfeited if:

a. If the bidder(s) withdraws its bid during the period of bid validity as specified in the bid.
b. If the bidder(s) does not accept computational/arithmetical error correction made by EESL and as explained in "Financial Evaluation" section of the Bid/ Tender document.
c. If the bidder(s) does not accept assumptions, estimations etc. used for evaluation of bids as specified by EESL in tender documents and revision of its bid accordingly, in case other assumptions are used. If the bidder(s) does not accept the sharing as specified in the bid.
d. If the Bidder(s) refuses to withdraw, without any cost to the EESL, any deviation not listed in Attachment-5 but found elsewhere in the bid; or
e. In the case of successful bidder(s) fails to sign the contract agreement within 28 days of placement of LoI/Award letter and to furnish the required contract performance guarantee, in accordance with the tender document.

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Table-A

PRICE BID FORMAT(for Smart Meters)

(produced here for illustration purpose; to be filled-up ONLINE only) Name of the Bidder:_

Sr. No	Item Name	Proposed Quantity	Unit of Measurement	Base price per unit exclusive of GST (IGST/ CGST/ SGST/ UGST) FOR Destinations basis (in Rs.)	Total price exclusive of GST (IGST/ CGST/ SGST/ UGST) FOR Destination basis (in Rs.)	Total price exclusive of GST (IGST/ CGST/ SGST/ UGST) FOR Destination Basis (in Rs.)
					In Figures	In Words
	1	**2**	**3**	**4**	**5=2*4**	**6**
A	Single Phase Whole Current Smart Meters (including communications module) as per IS 16444 Part 1 with accuracy class 1 and current rating of 10-60A	16,45,000	(Nos.)			
B	Meter Box for Single Whole Phase Smart Meters (Inclusive of All Necessary Accessories)	16,45,000	(Nos.)			
C	Three Phase Whole Current Smart Meters (including communications module) as per IS 16444 Part 1 with accuracy class 1 and current rating of 10-60A	6,81,500	(Nos.)			
D	Meter Box for Three Phase whole current Smart Meters (Inclusive of All Necessary Accessories)	6,81,500	(Nos.)			
E	LT-CT Operated Three Phase Smart Meters (including communications module)as per IS 16444 Part 2 with accuracy class 0.5S and current rating of -/5A	23,500	(Nos.)			
F	Meter Box for LT-CT operated Three Phase Smart Meters (Inclusive of All Necessary Accessories)	23,500	(Nos.)			
				Grand Total (A+B+C+D+E+F)		

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Other terms and conditions

1. The Bidder shall indicate in the Price Bid, the unit prices in Rs. (INR) and total Bid prices of the Goods in the prescribed format only. Bidders shall quote for the complete requirement of Goods specified under the Contract on a single responsibility basis, failing which such Bids will not be taken into account for evaluation and will not be considered forward.
2. The bidder should compulsorily quote for all heads in the price-bid format for which the bidder should do separate analysis/ reasonable estimation of all heads before quoting the rates in the financial bid. Any contravention may lead to rejection of offer submitted.
3. Any other item as required for commissioning the system for reliable and efficient operation to be provided within the quoted price.
4. The above prices are exclusive only of GST. Successful bidder mandatorily registered itself under GST act.
5. The bidder shall submit PAN and GST number in support of claim of GST.
6. Bidder's to quote for all items in each bid otherwise their bid will be rejected.
7. If there is a discrepancy between words and figures, the amount written in words will prevail.
8. Prices will remain firm till the execution of the contract.
9. Please provide HSN/SAC code related to items/services.
10. Further, the bidder(s) must make sure that any compliances, to be ensured by EESL are communicated to EESL by the bidder(s) and if required, EESL may take assistance from the bidder(s) to execute such compliance(s) and the bidder(s) shall be reimbursed the statutory fee only, for performing compliance(s) on behalf of EESL applicable on EESL.
11. EESL have the rights to accept or reject any bid or part without assigning any reason.
12. Maximum quantity is mentioned here for illustration purpose for determination of L-1 only. Bidder(s) shall mention the appropriate quantity as per its capacity (**Attachment 11** of section - 6, Forms & Procedure.)
13. Minimum quantity to be quoted against each line item of above mentioned in price bid table is 40% of the maximum quantity against respective line item.
14. **Note: No Deficient Documents/Clarification shall be called. Bidder shall ensure that their bid is complete in all respect and all the documents as asked in the tender document are submitted under respective envelope. It shall be sole responsibility to the bidder to carefully examine the tender document and submit all the documents asked in the tender.**
15. For MSME bidders, following NIC code(s) defining the bidder to be registered as MSE for the item tendered shall be acceptable in the Udyog Aadhar Memorandum (UAM) submitted by the bidders to claim exemptions applicable to MSEs.

NIC 5 Digit Code	Description
26513	Manufacture of consumption meters for electricity, water or gas, flow meters and counting meter

Bidders submitting UAM Certificates not containing above mentioned NIC code shall not be eligible for exemptions applicable to MSEs.

I/We have read all the terms and conditions of the RFP/IFB/NIT and the Annexure(s) thereto and agree to accept and abide by the same in toto. The above quotation has been prepared after taking into account all the terms and conditions of the RfP/IFB/NIT.

Dated:

(SEAL)
Signature of Tenderer or
Their Authorized Representative:
Name & Address of Tenderer:
Phone No:
Fax no.:
Mail-ID

Eligibility & Qualifying Requirements

In addition to the satisfactory fulfillment of requirements stipulated under section ITB, the following shall also apply:
Note: Apart from the criteria given below, past performance of bidder with EESL, i.e., related to quality, supply, performance, commissioning etc. shall be taken into consideration by EESL during bid evaluation.

Sr No. (A)	Criteria (B)	Documents to be submitted (C)
1	Bidder should be a Single Entity means a limited company (as defined in the Companies Act, 1956 or further amendments thereof)) OR A limited liability partnership (under the Limited Liability Partnership Act, 2002 or further amendments thereof	Photocopy of Certificate of Incorporation issued by the Registrar of Companies AND Memorandum of Association, Article of Association needs to be attached along with the bid. The bidder should also highlight the relevant provision/ article number which highlights the objects relating to in-house manufacturing of smart meters OR LLP registration certificate issued by registrar of Companies

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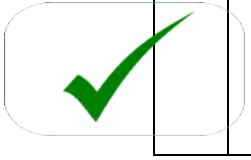
2	The bidder should be a manufacturer of Smart meters.	The Bidder should submit an Excise Registrations Documents/GST Registration Documents as a 'Manufacturer' and Factory License under the Indian Factories Act, 1948. /ISO certificate /Company registration/any other document which shows that the bidder is a manufacturer of Smart Meters. OR MSME registration certificate (issued as manufacturer) as a supporting document for being a manufacturer of Smart Meters.
3	Bidder should have successfully supplied ***7,05,000 nos. of Electricity meters during*** the last 3 years in any Government Dept./PSU/ULB/DISCOMS/Private Limited Companies (as on the date of publication of the tender).	Documentary evidence shall be furnished along with the bid. Documentary evidence should be submitted in the form of copies of relevant work orders/ contract agreement/ purchase order along with copies of any document in respect of satisfactory execution/ completion certificate of each of those purchase orders/ work orders such as (i) Satisfactory completion (OR) (ii) any other documentary evidences that can substantiate the satisfactory execution of each of the purchase order/ work order submitted. ***Work orders along with its evidence for successful completion shall be from any Government Dept./ PSU/ ULB/ DISCOMS which will only will be considered for evaluation.*** In addition to above in case of private limited companies , copy of e-way bill/consignee receipted challan/GST return shall also be submitted as the proof of evidence for successful execution of the work order(s)/purchase order(s)
4	Bidders should have Average Annual Turnover (ATO) of at least 82.50 **Crores** for immediately preceding last three financial years 2017-18, 2018-19 and 2019-20. Signature :- Subject : CN=PRASHANT KUMAR, ST=DELHI, OID.2.5.4.17=110003, OU=SUPPLY CHAIN MANAGEMENT, O=ENERGY EFFICIENCY SERVICES LIMITED, C=IN User ID : p.kumar Serial No : 11D14A5	Duly authorized copy of audited annual report is to be submitted by respondent along with CA certificate. The bidder shall submit last 3 years' audited financial statements i.e. FY 2017-18, FY2018-19 and FY 2019-20. Turnover means revenue from operations (excluding other income)



5	The bidder should be profitable in any of the two previous financial year out of the last three completed financial year.	Duly authorized copy of audited annual report is to be submitted by respondent along with CA certificate. The bidder shall submit last 3 years' audited financial statements i.e. FY 2017-18, FY2018-19 and FY 2019-20 Profitability means: Profit after tax
6	The net worth of the bidder in immediate last financial year should not be less than 100% of paid up share capital. *Net worth of Proprietor/ partnership Net Worth may be considered negative in case closing capital of immediately preceding year is less than average closing capital of previous 3 financial years.*	Duly authorized copy of audited balance sheet for preceding last three Financial Year is to be submitted by bidder.

Notes:

(1) EESL reserves the right not to seek any deficient /Clarifications from the bidders after opening of Techno-Commercial bid. If any bid is found to be in non-conformance to the tender conditions or deviating from the tender, EESL resaves the right to out rightly reject such bid without seeking any clarification. Bidder to take cognizance of the same and submit their bid accordingly.

(2) EESL reserves the right the use the in-house available data, if required, to evaluate the tender including the data/documents submitted by the vendor in their previous tender(s). However, this should not be understood that relevant documents/certificates or any other requirement as required in the instant RfP is not to be provided by any vendor participating in the tender who has earlier participated in any of the earlier tenders by EESL

(3) In case, bidder is unable to produce the audited financial statement for Financial year 2019-20, then for the evaluation purpose (for QR no. 4, 5 and 6), last 3 completed financial year would be 2016-17, 2017-18 and 2018-19 considered. Thus, bidder may submit audited financial statement for 2016-17 in place of 2019-20. However, once bidder submits audited financial statement for 2016-17, then in no case, 2019-20 would be considered for evaluation and vice versa.

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Functional Requirements of Advanced Metering Infrastructure (AMI)

In India

CENTRAL ELECTRICITY AUTHORITY

August, 2016

1 . Functional Requirements for Advanced Metering Infrastructure (AMI)

These functional requirements define the minimum functionalities and performance for AMI system proposed to be developed in India. The main objective of AMI is to enable two way communication between smart energy meter and Head End System(HES) to enable remote reading, monitoring & control of electrical energy meters (consumer, feeder, DT meters etc.) to serve as repository of record for all raw, validated and edited data. The sanitized data may be subscribed by other utility function for higher order analysis and billing and collection engine etc.

2. Basic Functions of AMI

The AMI system shall help utility to manage their resource and business process efficiently. AMI system shall support the following minimum functionalities:

a) Remote Meter data reading at configurable intervals(push/pull)

b) Time of day (TOD)/TOU metering

c) Pre paid functionality

d) Net Metering/Billing

e) Alarm/Event detection, notification and reporting

f) Remote Load Limiter and connection/ disconnection at defined/on demand conditions

g) Remote firmware upgrade

h) Integration with other existing systems like IVRS, Billing & collection software, GIS mapping, consumer indexing, new connections & disconnection, analysis software, Outage Management System etc.

i) Import of legacy data from existing modules/ MDAS of RAPDRP where ever possible. The extent and modalities of integration with the existing system including RAPDRP has to be worked out by the bidder.

j) Security features to prevent unauthorized access to the AMI including Smart meter & meter data etc. and to ensure authentication of all AMI elements by third party.

This is only an indicative but not exhaustive list. The system should be capable to support the other functionalities as per the requirement of utilities.

The System should accurately maintain system time synchronization across all devices to ensure accuracy of data. The system should support the interfacing with the future Smart Grid functionalities like outage management system, distribution automation including self-healing system, distribution transformer monitoring units, Electric vehicle, distributed energy

resources etc. The communication network shall preferably be able to support multiple applications.The Bidder shall submit an approach paper describing overall architecture and operational philosophy of the proposed AMI solution and methodology for achieving different functionalities, specified in this document and also highlight additional features, if any.

3. General AMI System Requirement

Smart Meter (Single phase whole current, Three phase whole current, CT & PT operated three phase meters and CT operated three phase meters) for consumers/ system shall be provided based on Radio Frequency (RF) mesh in license free frequency band/ Power Line Carrier Communication (PLCC) or GPRS/3G/4G communication technology or combination of these technologies as per the site requirement and to ensure the performance level given in this document. The smart meter data using RF mesh/PLCC shall be collected by Data Concentrator Units(DCUs)/Access point and transported to HES through WAN while the data from smart meters using GPRS/3G/4G technology shall be transported directly to HES through WAN. The AMI Implementing Agency (AIA) shall be responsible for proper data exchange among Smart meter, DCU, MDM, HES and other operational/requisite software as part of fully functional AMI system.

AIA shall adhere with the appropriate security algorithm for encryption and decryption. For smooth functioning of the entire system, it is essential that the details of such algorithm including the mechanism of security key generation be kept in a secured escrow account which shall be used by the utility only in case of termination of the contract for reasons whatsoever.

AIA may design appropriate architecture for providing end to end metering solution. AIA is free to decide upon the best solution out of all the available options. However, the entire responsibility of fully functional AMI system shall rest with one agency i.e. AIA in order to meet the performance levels as given in this document. The communication provider may adopt Radio Frequency (RF) mesh in license free frequency band/ Power Line Carrier Communication (PLCC) or GPRS/3G/4G communication technology or RF based canopy system or a combination of these technologies as per the site requirement adopting best available technology in the proposed area of implementation.

The following core components of AMI system shall be provided:

a) Smart Meters

b) Communication infrastructure

c) Head End System(HES)

d) Meter Data Management System (MDM)

e) Web application with updated on-line data of consumers etc.

f) Mobile app: AMI Implementing Agency (AIA) shall provide a mobile app through which consumer shall be able to log in through android/iOS/Window based mobile app to see information related to his/her energy consumption. App shall also provide platform for implementation of peak load management functionality by providing existing tariff & incentives rates, participation options etc. This mobile

app shall be part of complete system and therefore no additional cost shall be payable for upgradation / maintenance separately.

4. Smart Meters (Single phase & Three phase)

 Single Phase & Three Phase whole current smart meters shall comply with the enclosed Technical Specifications. Three Phase CT operated meter shall comply IS 14697 till the relevant IS for CT operated smart meters is available. The supplier / manufacturer would furnish valid BIS certification before supply of meters.

 The Smart meter installation shall be done by the AMI Implementing Agency (AIA) as per the rules and regulations and practices of Utility.

After meter installation, customer identification no., meter ID, its hardware & software configuration, name plate details, make, type i.e. 1 Phase or 3 Phase, etc.(as per requirement of utility) shall be updated in DCU/HES/MDM. The information would also be updated on the portal/app for providing information to consumers.

5. Communication infrastructure

The communication infrastructure should either be based on RF mesh network / PLC or cellular network or a combination of these. The communication network shall be based on suitable standards from ITU/IEC/IEEE/CEN/ CENELEC/ ETSI for NAN and WAN network. Communication network shall provide reliable medium for two-way communication between various nodes (smart meter) & HES. RF based network should use license free frequency band available in India. The engagement of network service provider would be in the scope of AMI Implementing Agency to meet the performance level as given in the document.

5.1. General Requirement

The AMI Implementing Agency (AIA) shall design a reliable, interference free & robust communication network keeping in view the site conditions. It shall be flexible in terms of providing communication in variable terrain & urban density.

The AIA shall design the network architecture keeping in view the existing and planned infrastructure of the utility. During designing, suitable consideration shall be kept for future expansion as per requirement of Utility. Before designing the communication network, the AMI Implementing Agency (AIA) shall do the site survey and would provide the most efficient communication infrastructure.

The entire infrastructure & associated civil works required for installation & commissioning of equipment/devices like DCUs, repeaters, routers & access points etc. shall be in the scope of AMI Implementing Agency (AIA). The operational testing of all the network elements has to be demonstrated by the bidder to the satisfaction of the utility.

The network solution offered by the bidder should have disaster recovery mechanism in place. The redundancy mechanism of HES and MDM and their disaster recovery plan shall also be described by the Bidder.

The quality of installation of the various equipment & power supply wiring to all field equipment shall be as per standards/ regulations/prevailing practices of the utility. The supply of electricity needed for operation and maintenance of entire AMI system shall be the provided by the utility free of cost.

A suitable network management system (NMS) shall be provided to monitor the performance of the communication network round the clock. The NMS shall provide viewing of all the networking elements deployed at site and enable configuration & parameterization of the networking devices and the nodes.

5.2 Network Security

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

- **Secure Access Controls:** The system shall include mechanisms for defining and controlling user access to the operating system environment and applications. Best practices from enterprise security including password strength, password aging, password history, reuse prevention etc. must be followed for access control.
- **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.
- **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.
- **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.
- **Malicious Software Prevention:** Implementation of anti-virus software and other malicious software prevention tools shall be supported for all applications, servers, data bases etc.
- **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.

5.3. Communication Network Elements (DCU based or Router Based):

5.3.1. Data Concentrator Unit (DCU) based Communication Network

The Data Concentrator Unit is a gateway for communication of data between the Smart Meters and the HES. The Data Concentrator Unit receives information from the Smart Meter on a scheduled / need basis and stores the data, which can be accessed by HES for onward transfer to MDM.

The DCU provides the central link between Smart Meters and HES, enabling continuous/periodic meter read and control. DCU shall exchange data from smart meters on RF / PLC communication and with HES on WAN.

If communication system is DCU based RF network, then following requirement shall be met.

5.3.1.1 Hardware & Power Supply of DCU

- Enclosure/box of DCU shall be minimum IP55 or better compliant. A suitable mounting arrangement required for DCU installation shall also be provided.
- A suitable and optimum power supply shall be provided keeping in view that even in case of outage in one or two phases, DCU can be powered. DCU should be capable of withstanding surges & voltage spikes of 6KV as per IEC 61000-4-5 standards. Power supply shall be terminated on suitable sized MCB to facilitate isolation during on-site maintenance.
- DCU shall have battery with backup for 1 hour for normal meter reading, to push tamper event, carry out on demand reading and the network health status / connectivity continuity & check. DCU should have the suitable feature to send power outage and restoration message to the HES. The battery shall have a guaranteed life of 10 years.
- DCU shall have built in Real Time Clock (RTC) with separate battery backup. The battery shall have a guaranteed life of 10 years. It shall have self- diagnostic feature for RTC, memory, battery, communication module, etc. Alternatively, Software driven RTC may also be used as per agreement between supplier and utility.

5.3.1.2 Configuration, Functionality & Interface of DCU

DCU shall have following configuration functionalities:

- It shall be able to configure the communication with underlying nodes/meters.
- It shall pull data from the field devices and push the data at configured intervals to the HES. It should also support the HES in pulling data from the field devises/meters. The data acquisition (Push/Pull) frequency shall be programmable. DCU shall be capable to prioritize control commands.
- DCU shall ensure a secure communication to HES and shall have internal memory for storing interval data for at least 5 days.

- DCU shall support on demand read and ping of individual/group of meters.
- It shall support IPv4 / IPv6 network addressing.

- DCU shall push events like tamper, power off etc. to HES immediately on occurrence/receipt from field devices/meters.

- The equipment shall be weatherproof, dustproof and constructed for outdoor installation on poles (minimum rating: IP-55). A suitable mounting provision shall be made for the equipment.

- Enclosure: Provision for security sealing shall be provided and in case the gasket of the cover is used for protection against moisture, dust and insects, the gasket shall be made of weather and aging resistant material.

- The list of standards followed in all the devices/equipment used in communication network shall be furnished

5.3.1.3 DCU Communication

- The communication architecture shall be any, as defined under IS 16444.

- The DCU shall ensure the appropriate backhaul for secure transfer of data to HES. In case of GPRS/3G/4G backhaul, it shall support SIM card from any service provider. It shall have Wide Area Network (WAN) connectivity to the HES through suitable means.

- DCU shall be able to communicate with meters either on RF mesh (license free band) or PLC.

- DCU shall periodically monitor meter reads/downstream commands and shall retry and reconnect in case of failed events/reads.

- It shall push events like tamper, power off etc. to HES immediately on occurrence/receipt from field devices/meters. DCU shall be able to acquire and send data to HES for full capacity (as per designed for no. of meters/field devices) to ensure the performance level. Full capacity of DCU is required to be indicated in the offer.

- After Power Interruption, on restoration of power supply, DCU shall establish communication with underlying devices as well as upstream application automatically.

- DCU shall be able to communicate with the nearest meters depending on topographical features. For further communication among the meters, distance of the other meters with the DCU shall not be a constraint as communication of the nearest meters shall be established with other meters through appropriate mesh formation / other formation.

- Remote Firmware Upgrade: The DCU shall support remote firmware upgrades as well as remote configuration from the control center. Configuration of programmable parameters of smart meters shall be done through HES.

- All meters falling under one DCU shall be commissioned and checked for proper communicationin presence of utility in-charge.

 DCU shall keep the records of minimum of the following events:

- No of packet failures
- Retry attempts
- Missed periodic readings
- Failure to connect
- Tamper events

5.3.2 Router based RF Mesh Network

If communication system is router based RF mesh network, then following requirement shall be met. In this type of communication network, different nodes (smart meters) shall interconnect with each other using RF mesh network and they shall communicate with nearby routers to transfer the data to access points. In such communication network, if any routers/repeaters/access points fail, then nodes connected on that device shall automatically reconfigure the mesh with available nearby nodes.

5.3.2.1 General Requirement of Router based RF Mesh Network:

The general requirements for the Router based RF network are specified below:

i) The communication network shall have dynamic & self-healing capability. If one of the communication element like router or access point fails then nodes connecting to that element shall switch to best available element for communication of data to HES.

ii) It shall support IPv4 / IPv6 network addressing.

iii) Each node shall keep a track of best available nearby nodes.

iv) The communication network equipment shall use licence free frequency spectrum as defined by Government of India.

v) All the communication network equipment shall be certified by WPC, Government of India for operation in licence free frequency band.

vi) Suitable network management system (NMS) shall be available to monitor the performance of the communication network round the clock. The NMS shall provide viewing of all the networking elements deployed at site and enable configuration, parameterization of the networking devices and the nodes.

vii) It shall support remote firmware upgrading

viii) It shall be secure enough to avoid all cyber threats like DDoS, spoofing, malwares etc.

ix) The communication network shall ensure secure communication of data to HES.

x) The equipment shall be weatherproof, dustproof and constructed for outdoor installation on poles (minimum rating: IP-55). A suitable mounting provision shall be made for the equipment.

xi) Enclosure: Provision for security sealing shall be provided and in case the gasket of the cover is used for protection against moisture, dust and insects, the gasket shall be made of weather and aging resistant material.

xii) The list of standards followed in all the devices/equipment used in communication network shall be furnished.

xiii) Routers / Access Points shall have suitable power supply arrangements. Provision of battery backup for at least 1 hour shall be there to continue operation in case of power supply failure. The life expectancy of battery shall be 5 years or more.

5.3.2.2 Configuration, Functionality & Interface

Access points shall have following configuration functionalities:

- It shall be able to configure the communication with underlying nodes/end points.
- It shall support on demand read and ping of individual/group of meters.
- It shall push events like tamper, power off etc. to HES immediately on occurrence/receipt from field devices/meters.
- It shall have Wide Area Network (WAN) connectivity to the HES through suitable means.
- It shall communicate with routers/nodes/end points on RF mesh (license free band).
- It shall periodically monitor meter reads/downstream commands and shall retry and reconnect in case of failed events/reads.
- After power Interruption, on restoration of power supply, it shall establish communication with underlying devices as well as upstream application (HES) automatically.
- Access point shall facilitate recording of
  - No of packet failures
  - Retry attempts
  - Missed periodic reading
  - Failure to connect
  - Tamper events
- It shall be capable to handle interval data of suitable nos. of any type of smart meter (1ph/3ph). Access point shall be able to acquire and send data to HES for full capacity (No. of meters/field devices it is designed for) within a suitable time period to achieve the performance level. Full capacity of access point is required to be indicated in the offer.
- Access point shall support remote firmware upgrades as well as remote configuration from the control center.

5.3.3 Testing of the DCU /Access Point

DCU/Access Point shall be tested for the following:

- Radio interference measurement (CIS PR 22)
- Surge test (IEC 610004-5)

- Fast transient burst test (IEC 61000-4-4)
- Test of immunity to electrostatic discharges (IEC 61000-4-2)
- Test of immunity to electromagnetic HF field (IEC 61000-4-3)
- Resistance to heat and fire

The bidder shall provide IP-55 compliance test certificate for DUC/Access Point.

6. Head End System (HES)

The main objective of HES is to acquire meter data automatically avoiding any human intervention and monitor parameters acquired from meters.

The AMI Implementing Agency (AIA) shall provide the HES suitable to support the collection and storage of data as per performance level for a defined no. of smart meters with facility of future expansion as per the requirement of the utility.

(NOTE: The no of smart meters/future expansion may be provided by utility as per their requirement)

HES would perform all the requisite functions as per the defined functionalities of AMI and i t is the responsibility of the AMI Implementing Agency (AIA)/ System Integrator to supply the requisite software and hardware to achieve the defined functionalities of AMI. HES shall ensure data integrity checks, for example, checksum, time check, pulse, overflow, etc. on all metered data.

HES shall be developed on open platform based on distributed architecture for scalability without degradation of the performance using additional hardware. HES shall support storage of raw meter data, alarms and alerts for minimum 3 days. Adequate data base and security features for storage of data at HES need to be ensured.

The suggested functions of HES (not exhaustive) may be :

- Acquisition of meter data on demand & at user selectable periodicity
- Two way communication with meter/ DCU
- Signals for connect & disconnect of switches present in end points like meter
- Audit trail and Event & Alarm Logging
- Encryption of data for secure communication
- Maintain time sync with DCU / meter
- Store raw data for defined duration
- Handling of Control signals / event messages on priority
- Setting of Smart meter configurable parameters

- Communication device status and history
- Network information in case more than one technology is deployed in field between the two devices
- Critical and non-critical reporting functionality. The suggestive critical events may be alarms and event log for meter events like tamper/power failures etc., if data is not received from DCU/Meter, if relay does not operate for connect / disconnect or there is communication link failure with DCU/Meter or network failure while non critical events may be retry attempts on communication failure, periodic reading missing and failure to connect etc.

6.1 Configuration

HES shall facilitate programming of following meter parameters:

- Load profile capture period
- Demand integration period
- Setting of parameters for time of day (TOD/TOU) billing
- Prepaid function
- Net metering
- Billing date
- Clock setting/time synchronization
- Load curtailment limit
- Event setting for connect/disconnect
- Number of auto reconnection attempt
- Time interval between auto reconnection attempt
- Lock out period for relay
- Remote firmware upgrade
- Password setting
- Push schedule
- Setting threshold limits for monitored parameters
- Provision for adding more programming features in future (The AIA may suggest more parameters as per the requirement)

6.2. Integration

HES shall preferably interface with MDM on standard interfaces and the data exchange models and interfaces shall comply with CIM / XML / IEC 61968 or any other open standard. The solution shall be Service Oriented Architecture (SOA) enabled.

7. Meter Data Management System (MDM)

The Meter Data Management System shall support storage, archiving, retrieval & analysis of meter data and various other MIS along with validation & verification algorithms. It shall act as a central data repository. MDM shall have capability to import raw or validated data in defined formats and export the processed and validated data to various other systems sources and services in the agreed format. It shall provide validated data for upstream systems such as billing, consumer Information system, customer care, analytics, reporting, Network planning & analysis, load analysis/forecasting, Peak Load Management, Outage management etc.

MDM should also support the future requirement of utility and should support the integration of other smart grid functionalities like Distribution Transformer Health Monitoring system, self-healing system etc. as and when implemented by the utility.

The vendor shall specify and deliver an initial system that supports the collection and storage of data for meeting the performance level for the ***defined no of consumers/ smart meters*** **(The exact Number have to be defined by the utility as per no of consumers of city/town/village)** with facility of future expansion.

The MDM shall have the ability to selectively choose which data to be maintained and which to be purged or archived as per requirement of Utility (user selectable).

7.1. Functional Requirements

7.1.1 Asset Management

- The MDM shall maintain information and relationships between the current installed meter location (apartment, shop, industry/ address etc.), Consumer information (Name etc.), Consumer account no, Meter ID, Type of Meter (type of consumer, 1 phase/ 3phase, with o r wi t h o u t relay, etc.), Meter configuration (Demand integration period, Load profile capture period etc.), GIS supplied information (longitude, latitude , connection with feeder/ transformer/ pole etc.) etc.
- The software should support tracking the status of meters and communication equipment from the date when they are installed in the field. The history of in-service asset location is maintained throughout the device life with start and end dates associated with each in-service location reference.
- Ability to report and log any damage / deterioration in the meter attributable to consumer /utility.

7.1.2 AMI Installation Support

- The MDM shall also support device lifecycle management from device registration, installation, provisioning, operations and maintenance to decommissioning etc. The MDM shall generate exceptions for meter or modules not delivering the correct meter data after installation.

- The MDM shall provide a reconciliation report that identifies the meters that have been installed but not communicating for a designated (configurable) period. MDM shall generate reports on the number of meters installed in comparison to the number of meters successfully communicating.

7.1.3 Meter Data

- The MDM shall accept input, process, store, and analyze Meter data from HES and meter data collected through hand held meter reading instruments and manual meter reads. In case of manual reads, provision should be there to insert associated notes like assessed energy, etc.

- The MDM should accept input, process, store, and analyze non-billing meter data such voltage and power quality data (like under/over voltage etc) as they are available from AMI Head End Systems. The MDM should also support schedule and on-demand meter reads and pinging of meter energized states by authorized users and by other utility systems.

- The MDM shall provide storage of all collected Meter Data, events and alarm. It shall have capacity of storing 5 years data or more via archiving.

- Correctly track & resolve energy usage across meter changes with no loss of individual meter data.

- Provide complete history and audit trail for all data collected from meters including commands sent to meters and other devices for 30 days (configurable period).

- Execute on-demand read processes.

- Handle special metering configurations like net metering/multiple meters at same premises.

- The MDM shall have the ability to manage at a minimum 15 minute interval data.

- Data Integrity- AMI Implementing Agency (AIA) shall ensure data integrity checks on all metered data received from data collection systems.

7.1.4 Data Validation, Estimation, and Editing (VEE)

- The validation and estimation of metered data shall be based on standard estimation methods. The MDM should also support and maintain following data-

a. **Registered Read Data** including register reads, daily billing cycle, as well as derived billing determinants like TOU

b. **Interval Data** channels with variable intervals and variable units of measure

c. **Calculated Data** that is derived or computed such as billing determinants and aggregated loads.

d. **Event data** storage of all collected event and alarm data from meters, network equipment, and MDMS itself

- MDM shall flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur in the cumulative ("CUM") register reads
  - CUM Decrements within a billing cycle (except net-metering)
  - CUM reads increments more than configurable threshold
  - Future or old read dates
  - Number of digits exceeds number of meter dials
- MDM shall detect, flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur in Time of Use (TOU) register reads
  - Register Decrements (except net-metering)
  - Resets (to zero) (except net-metering)
  - CUM reads increments more than configurable threshold
  - Future or old read dates
  - Erratic compared to CUM read (sum of TOU reads minus CUM read)
- MDM shall detect, flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur in Demand register reads
  - Do not reset on cycle
  - Do not reset coincident with customer move-out or move-in
  - Reset off cycle inappropriately
  - Too high
- All data shall be transferred to billing system after meter data validation and estimation including transformer / feeder station wise energy audit.
- MDM shall estimate usage for non-metered service points such as street lights, farm lights, traffic signals, etc.
- The MDM shall maintain both the original received raw data in a non- manipulated state, in addition to VEE data.
- Notwithstanding the latency of data collection via the AMI system, once the MDM receives meter read data, the VEE process occurs in real-time and the post-VEE data is then immediately available to user or external systems.
- The MDM shall be able to automatically flag data changes from manual edits, VEE (Validating, Editing and Estimating) rules and data source corrections and electronically generate audit trail with timestamps and user-ids.

7.1.5 Billing Determinants Calculations

The MDM-

- Shall allow configuring multiple TOU/TOD options (e.g. the number and duration of TOU rate periods) by customer type, tariffs and day type (weekend, weekdays, and holidays) and by season.

- Shall support the processing of interval data into billing determinants to include the following at a minimum:

  - Total Consumption
  - Consumption in different time blocks for ToU billing
  - Maximum Demand (in kW and kVA)
  - Number of tamper counts
  - Average power factor

- Shall process interval data and frame it into the appropriate TOU periods for consumption and demand; for example, roll up 15/30 minute data intervals into hourly data.

- Shall have the ability to properly account for special metering situations such as check metering, sub metering, prepaid metering and net metering when calculating billing determinants and sending them to billing and other systems.

- Shall have the ability to properly account for special situations including, but not limited to, curtailment requests, demand response scenarios when calculating billing determinants and sending them to billing software.

7.1.6 Exception Management

- Ability to capture and log data exceptions, problems and failures and to generate management reports, provide trend analysis, automate generation of service requests and track corrective actions.

- Ability to group, prioritize, filter and send system generated alarms and events to predetermined email addresses, cellular text messages to phone numbers/SMS/customer care etc.

- Exception Generation - MDM shall generate exceptions based on configurable business rules including but not limited to the following:

- Meter tamper alerts
- Communication module health alerts for Meter/DCU
- If the consumption is less/more than pre-defined average consumption
- Negative Consumption (not for net-metering)
- Power outage indications received from the Smart meter

7.1.7 Service Orders

 The MDM shall generate service orders based on configurable rules for various events and alarms such as stop meter, tampers, problem in communication networks, AMI host server, etc.

 MDM shall send service orders via SMS, email, etc. with the email addresses / phone numbers being configurable. MDM shall receive feedback on action taken on the service order and track the status of service orders.

7.1.8 Customer Service Support

 The solution shall provide customers with access to current and historical consumption and interval data, outage flags, voltage and power quality indications. The data shall be displayed in graphical and tabular form depending on user choice. The Customer may also access data through customer portal. The solution shall integrate via a user friendly graphical interface.

 MDM shall support email/SMS notification of configured alarms & events to selected users.

 The MDM shall support the web portal or shall have the ability to interface with the 3rd party portal/utility portal to provide the consumer near real time online views of both usage and cost and helping consumers to understand electricity usage and cost information, alerts and notifications and energy savings tips with different levels of detail. The portal should support the view for past electricity usage, last week's, yesterday's, current days or other period etc. as per selection. The portal should provide user friendly access to consumer for their data via colorful graphs and charts and can download the data into a spreadsheet.

 Shall support mobile app through which consumer shall be able to log in through android/iOS/Window based mobile app to see information related to his energy consumption. App shall also provide platform for implementation of peak load management functionality by providing existing tariff & incentives rates, participation options etc.

7.1.9 Analysis

The MDM shall have analysis capability based on configurable business rules including but not limited to the following:

- Display consumption/load profiles by configurable period (15/30 min, hour, day, month, year etc.) day type (weekday, weekend, holiday, festival wise etc.) and by tariff, customer type, or any user specified collection of meters.
- Generate peak & off-peak load patterns by aggregating all loads of DT/Feeder/consumer group.
- Perform DT/feeder wise energy audit.
- Perform load analysis for different groups and categories of consumers.
- Ability to provide the data to load forecasting, load research or demand response applications and perform error management like: Missed reads and

intermittent meter reads before taking into forecasting, load research or demand response

- Ability to configure the system to effectively visualize consumption trends, identify unusual patterns, and visualize load analysis to understand which assets are being over utilized.
- Analyzing data to identify new patterns of usage, Setting fraud alert / transformer overload alerts / demand – supply gap alert etc.
- Ability to receive and store outage and restoration event data from smart meters and outage systems and to log all such events for analysis.

7.1.10 Reporting

The solution shall include a list of the standard reports that are provided with the MDM including but not limited to following:

- Daily data collection report
- Usage exceptions
- VEE validation failures
- Missing interval Read date and times (on hourly, daily, weekly & monthly basis)
- Physical meter events (install, remove, connect, disconnect) & meter reset report
- Meter flags
- Meter inventory
- defective meters
- AMI performance measurements
- Threshold Exception

  The solution shall support users modifying standard reports to better meet specific reporting requirements.
- The MDM shall enable the Utility to deliver reports in standard digital format such as PDF, Excel, etc.
- Ability for GUI (Graphical User Interface) to set up or change report delivery to configurable email addresses, network file directories, ftp sites or printer systems without modifying source program code and without any proprietary language skills.
- All queries shall be generated through user driven drop down menu in GUI. The Bidder shall provide example queries to support internal report generation needs.
- Ability to provide daily & weekly interface exception reports between MDM and other subsystems e.g. billing, outage, etc.

- In case more than one technology of AMI (example PLC and RF between Smart Meter & DCU) deployed in the field The MDM shall generate report on the performance and availability of data being delivered per AMI technology.

7.1.11 Revenue Protection Support

- Ability to analyze meter tampering flags, power outages, usage trends and usage profiles to identify potential energy diversion situations, and produce daily reports, monthly reports and service order requests for investigation.
- The business rules for revenue protection alerts shall be configurable via a user-friendly interface.
- The MDM shall filter out revenue protection alerts that may be caused by field activities if the field activity information is provided to the MDM.
- The MDM shall support the analytics/investigation (i.e. view current and historical usage patterns) to valid suspected revenue protection issues.

7.1.12 Demand Control/Demand Response Support

Bidder shall describe how its MDM supports Smart Grid Demand Response programs involving Demand Response (DR) systems as part of PLM. The solution shall support the following analysis:

- Totaling the actual consumption during the DR event.
- Totaling the actual consumption of different groups that participated in the DR event.
- Comparing the actual to baseline consumption for the groups in above.
- The MDM shall support the tracking, monitoring and managing of Smart Meter and events, and monitors customer response to facilitate payment of customer incentives.

7.1.13 OMS/ other smart grid functionality support

MDM shall support Smart Grid OMS system as per the requirement of the utility. MDM shall support the interfacing with OMS software for providing AMI meter data needed for fault location identification and other requisite services like updating the data after attending the fault etc.

MDM should also support the interfacing of other smart grid functionalities like Distribution Transformer Health Monitoring system, self-healing system, electric vehicle etc. as and when implemented by the utility.

7.1.14. Additional Features

- **Net-Metering**

- MDM shall flag, alarm and trigger an estimating process including but not limited to when the following anomalies occur:

  - CUM decrements of forward energy within a billing cycle
  - Register decrements for Time of Use (ToU) of forward energy
  - Power generated(exported) by any net-metering consumer more than the installed capacity of solar PV rooftop system
  - Energy exported(exported) in any given day by any net-metering consumer more than the programmable threshold value

➢ **Prepaid functionality**

The prepaid functionality can either be availed at smart meter level or through MDM. In case of MDM, following shall apply

- The MDM should support pre-payment metering and capability to interface with pre-payment application.
- The prepayment should support the system that payment and connection parameters are stored centrally and the details are being updated to consumer portal/ app.
- The system should periodically monitor the energy consumption of prepaid consumer and decrease the available credit based on consumption.
- The system should send connect/disconnect command on the basis of available credit as per notified rules & regulations.
- The system should send low-credit notifications to the consumer when their balance approaches a threshold.

7.2 User Interface

The AMI Implementing Agency (AIA) shall provide user interface for the following:

Utility:

User interface for utility shall have ability for at least the following functionality:

- Compare total energy costs on one rate schedule vs. one or many alternative rates.
- Enable the user to see how different options within a rate affect costs.
- Enable the user to see how adjusting load or consumption levels or shifting them to different time periods influences costs.
- Compare multiple facilities against each other based on costs, average spend, cost per area and cost by weather.
- Display meter data at a user defined configurable cycle through a GUI that allows authorized users to view energy usage patterns and the data behind them for selected customers.
- Allow authorized users to view metered data, initiate and view reports, modify configurations, and initiate and update service requests via a GUI.

- Display via a GUI the energy usage profile for a single meter or group of meters. The load profile shall illustrate energy consumption and peak demand in user defined intervals for a user-specified time period.

- Display via a GUI the energy usage profile for a single meter or group of meters according to Time of Use (ToU) tariff.

- Access to a minimum of 5 years of historical energy usage and meter reads through the GUI.

- GUI to clearly and visually distinguish between metered, estimated, allocated and substituted data.

- GUI to provide role-based access based on user identity and user role. Shall have following types of users:

  - Administrator
  - Operator
  - Field staff
  - Viewer/Guest

- Configure the look, feel, and functionality of the MDM in accordance with business needs, business processes, and business conventions. (e.g. GUI, content, look and feel of screens, validation rules, exception handling, etc.).

- Ability for utility through user interface to set up alarm and event notifications that can be directed to a combination of configurable email addresses, cellular text messages or phone numbers.

- 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.

<u>Consumer:</u>

User interface for all authorized consumers shall have ability for at least the following functionality:

- View metered data, initiate and view reports
- View data according to Time of Use(ToU) tariff
- Can make request for connection/disconnection
- User can update mobile number/email
- Can initiate service requests for maximum demand updating, meter checking etc.
- In case on net-metering consumers, user can view data for both import & export
- In case of prepaid consumers, consumers can view recharge history & present balance.

o 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.

7.3 Integration with other Systems

MDM shall preferably interface with other systems on standard interfaces and the data exchange models and interfaces shall comply with CIM / XML / IEC 61968/IS15959/ Indian Companion Specification/ any other open standard. MDM solution shall be Service Oriented Architecture (SOA) enabled.

MDM integration with other systems shall include but not limited to the following:

- HES for data exchange from other AMI solutions
- Utility Administration
- Existing other Data Collection Systems
- IVR system, CRM, Consumer Portal
- Billing and collection system
- GIS Systems integration with CIS and with MDM system

 Support of interface with HHU or manual reading system etc.

AMI Implementing Agency(AIA) should provide suitable number of HHUs to read and update the data in MDM in case of any communication failure between meter and HES/MDM.

8. Performance Levels

(a) These performance levels shall apply to the complete AMI system.

(b) AMI system include the communications links provided by Network Provider /third parties such as telecommunications companies and AMI Implementing Agency (AIA) has to ensure the desired performance level.

(c) The performance levels are average performance levels over the period of a year and exclude force majeure events.

The following are the required performance levels -

➢ **Performance levels for collection of daily meter readings (as per IS 16444/15959 part 2)**

The following are the performance levels required for the daily collection of the previous day's interval energy data and total accumulated energy:

(1) All interval data from 95% of meters within 8 hours after midnight; and

(2) All interval data from 99.9% of meters within 24 hours after midnight.

- **Performance levels for remote reads of individual meters if data is not received on daily basis**

The performance level of an individual read applies to the collection of seven days of interval energy data and the current total accumulated energy from a particular AMI meter whose data is not being received on daily basis. The performance level required shall be:

(1) Action performed at 90% of meters within 1 Hour;

(2) Action performed at 99% of meters within 2 hours; and

(3) Action performed at 99.9% of meters within 6 hours.

- **Performance level for remote load control commands for selected consumers,**

The performance level required for individual meters shall be:

(1) Action performed at 95% of meters within 5 minutes;

(2) Action performed at 99% of meters within 10 Minutes

- **Performance level for remote connect/disconnect for selected consumers,**

The performance level required for selected individual meters shall be:

(1) Action performed at 90% of meters within 10 minutes;

(2) Action performed at 99% of meters within 1 hour; and

(3) Action performed 99.9% of meters within 2hours.

- **Performance levels for Meter loss of supply and outage detection**

Alarms to be received within 5 minutes for 90% of meters.

- **Performance levels for remotely altering settings in meter/ firmware upgrade**

The performance level required for individual meters shall be:

(1) Action performed at 99% of meters within 24 hours; and

(2) Action performed at 99.9% of meters within 36 hours.

- **Performance levels to remotely read events logs**

Performance level required for reading the full event log that pertains to an individual meter shall be:

(1) Action performed at 90% of meters within 30 minutes;

(2) Action performed at 99% of meters within 1 hour; and

(3) Action performed at 99.9% of meters within 6 hours.

To read the event logs pertaining to all meters:

(1) The data pertaining to 99.5% of meters with in 1 day;

- **Performance levels for updating of data on consumer portal/ app**

The performance level of updating of individual consumer data on portal/ app after receiving the data in MDM shall be:

(1) Action performed for 90% of consumers within 1 hour after receiving the data in MDM;
(2) Action performed at 99.5% of meters within 6 hours after receiving the data in MDM.

The performance level for generation of bills would be as per requirement of the utility. The performance levels regarding meter discovery time line after installation, on demand reading of meter data for operational purposes, outage restoration enquiry response time etc. would also be declared by the bidder.

Additionally, the Disaster Management timelines in terms of Recovery Time Objective (RTO) and Recovery Point Objective (RPO) of HES have to be defined by the bidder.

9. Performance Requirement for User Interface

The user interface performance testing shall be done as per following criteria-

S.No.	User Interface Requirements	Response Time
1	Any real time display and application display on workstation console along with data values shall appear on screen.	Within 2 sec
2	Manual data entry of the new value appears on screen.	Within 2 sec
3	Display Update rate	2 sec for 4 displays together
4	Response time for display of Alarm and event after receipt in system	Within 1 sec of receipt in system

5	Requests for printing of displays (to be acknowledged with an indication of request is being processed).	Within 2 sec
6	Requests for generation of reports (to be acknowledged with an indication of request is being processed).	Within 2 sec

10. Technical Obsolescence

The systems including communication technologies, which are at a risk of technical obsolescence over the next few years and over the operating life of the system should be identified and reported. This may also include end- of-sale and end-of-support policies governing the proposed technologies. The compatibility between the various elements of the system need to be considered and mitigation options, not be limited to periodic update from OEM/System supplier, shall be indicated in detail.

TechnicalSpecification of Single phase wholecurrent Smart Meter

CLASS 1.0 WITH BI-DIRECTIONAL COMMUNICATION FACILITY SUITABLE FOR ADVANCED METERING INFRASTRUCTURE (AMI)

TECHNICAL SPECIFICATIONS FOR WHOLE CURRENT A.C. SINGLE PHASE TWO WIRE SMART ENERGY METER OF ACCURACY CLASS 1.0 WITH BI-DIRECTIONAL COMMUNICATION FACILITY SUITABLE FOR ADVANCED METERING INFRASTRUCTURE (AMI)

1. SCOPE

The specification covers the design, manufacturing, testing, supply and delivery of AC whole current 1 phase 2 wires Smart Energy Meter with bidirectional communication facility. The meter shall be suitable for Advanced Metering Infrastructure (AMI). The meter shall communicate with DCU/Access Point/ HES on any one of the communication technologies mentioned in IS16444, as per the requirement of the utility.

2. BASIC FEATURES

The Smart Meter would have the following minimum basic features-

- Measurement of electrical energy parameters
- Bidirectional Communication
- Integrated Load limiting switch
- Tamper event detection, recording and reporting
- Power event alarms such as loss of supply, low/ high voltage
- Remote firmware upgrade
- Net metering features
- On demand reading

3. GENERAL STANDARDS APPLICABLE FOR METERS

Unless otherwise specified elsewhere in this specification, the performance and testing

of

the meters shall conform to the following standards with latest amendments thereof:

S. No.	Standard No.	Title

1	IS 13779 with latest amendments	AC Static Watt-hour Meter class 1& 2
2	IS 16444 with latest amendments	A.C. Static Direct Connected Watt Hour Smart Meter Class 1 and 2- Specification
3	IS 15884 with latest amendments	Alternating Current Direct Connected Static Prepayment Meters for Active Energy (Class 1 and 2)- Specification
4	IS 15959 Part 1 & Part 2 with latest amendments	Data Exchange for Electricity Meter Reading, Tariff and Load Control- Companion Standards

4. COMMUNICATION

Meter shall have ability to communicate with DCU/Access Point/HES on any one of the technologies mentioned in IS16444 in a secure manner, as per the site conditions and as per design requirement of AMI Implementing agency. In case of GPRS/3G/4G based meter, the meter shall accommodate SIM card of any service provider. In case of Plug in type communication module, the meter shall log communication module removal /non responsive event with snapshot.

4.1 Remote Load control facility would be as per IS 16444.

5. OTHER SPECIFICATIONS

Particulars	**Specification**
Applicable Standards	The meters shall comply with IS 16444 for all requirements. Those parameters which are not covered in IS 16444 have been specifically mentioned in this specification.
Reference Voltage	As per relevant IS
Current Rating	5-30 A/ 10-60 A (as per the requirement of the utility)
Starting Current	As per IS 16444
Accuracy	Class 1.0 as per IS 16444
Limits of error	As per IS 16444
Operating Temperature range	As per IS 16444
Humidity	As per IS 16444
Frequency	As per IS 16444
Influence Quantities	As per IS 16444
Power Consumption of meter	As per IS 16444

Current and Voltage Circuit	As per IS 16444
Running at No Load	As per IS 16444
Test output device	As per IS 16444
Meter Display	As per IS 16444
Name Plate & marking Meter Display	As per IS 16444
Parameters to be measured	As per IS 16444 / As per IS 15959 Part-2
Maximum Demand resetting	As per IS 15959 Part 2
Time of Use registers	As per IS 15959 part 2
Power Quality Information	As per IS 15959 part 2
LED/LCD Indicators	As per IS 16444
Load Survey/Interval Data	As per IS 15959 part 2
Tamper/ Event Recording	As per IS 15959 part 2
Measuring Elements	As per IS 16444
Alarm	As per IS 16444/ 15959 Part 2
Load Control	As per IS 16444
Connect/Disconnect and status of load switch	As per IS 16444
Programmability	As per IS 16444
Communication	As per IS 16444.
Communication Protocol	As per IS 16444
Remote Firmware upgrade	As per IS 15959 part 2
Real Time Clock(RTC)	As per IS 16444/ IS 15884 The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following: • From remote server through suitable communication network. • Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter; (The methodology for the synchronization would be as per requirement of uti lity)
Data Retention	As per CEA regulations

Battery Backup	Meter shall be supplied with separate battery backup for RTC.
Guarantee	Manufacturer Shall undertake a guarantee to replace meter up to a period of 60 months from the date of supply. The meter which are found defective/inoperative within the guarantee period, these defective/inoperative meters shall be replaced within one month of receipt of report for such defective/inoperative meters
First Breath(power on) and Last gasp (power off) condition detection and communication to HES	As per IS 16444

5.1 DATA DISPLAY FACILITY (AUTO/MANUAL)

Data Display shall be in three modes-

1. Auto Scroll
2. Scroll with Push Button
3. High Resolution (Shall display energy values with resolution of 2 digits before decimal and 3 digits after decimal in push button mode)

The display order shall be:

- Auto Scroll
  - Cumulative Active Energy kWh along with legend.
  - Current calendar month MD in kW with legend.
  - Instantaneous voltage
  - Instantaneous current

These parameters should be displayed on the LCD/LED continuously for a period of 15 seconds on Auto scroll. In case of power failure, the meter should display above parameters with push button.

- Scroll with Push-button o Internal diagnostics
  - Cumulative kWh
  - Date
  - Real Time
  - Voltage in (V)

- Current (I)
- Power (kW)
- Current month MD in kW
- Last month cumulative kWh
- Last month MD in kW
- Last month MD occurrence Date
- Last month MD occurrence Time
- Meter Serial Number

The meter's display should return to default display mode (continues auto scroll) if push button is not operated for more than 10 seconds. (The order of display may be revised as per requirement of the utility)

6. ANTI TAMPER FEATURES

The meter shall continue recording energy under any tamper condition and would log the event and send alarm at Head End System after detection of the defined theft features as per IS 15959 Part 2.

(Optional test as per requirement of utility: The Meter shall be immune under external magnetic influences as per CBIP 325. Meter shall be tested for high voltage discharge (Spark) up to 35 KV as per CBIP 325.)

7. TESTS

7.1 Type Tests & Test Certificates

Smart meter shall be type tested for all the type tests as per IS: 16444 (latest version) in a third party independent lab. The number of sampling for testing of meters and criteria for conformity would be as per IS 16444.

Necessary copies of test certificates shall be submitted as per agreement with the utility.

7.2 Routine & Acceptance Tests

The Factory Acceptance and Routine tests shall be carried out as per IS 16444. Apart from above test, meter shall be also be tested for all functional requirement through communication as part of acceptance test

8. GENERAL & CONSTRUCTIONAL REQUIREMENTS

8.1 Meter Shall be BIS marked as per IS 16444.

8.2 General & construction requirement shall be as per IS 16444/IS 13779

8.3 In Home Display (IHD) shall be optional and the specifications of the same would be as per agreement between the bidder and the utility.

9. **METER BASE & COVER-** Meter base & cover shall be as per IS 16444/ IS 13779. The meter Base & cover shall be break to open design. The material for meter base and cover shall be made of high grade polycarbonate.

10. **TERMINAL BLOCK & COVER** - As per IS 16444/IS 13779

11. **DESIGN**

Voltage circuit, sealing arrangement, terminal block, terminal cover and nameplate etc. shall be in accordance with IS-16444 (latest version).

The meter shall be compact and reliable in design, easy to transport and immune to vibration and shock involved in transportation and handling.

12. **CIRCUITRY -** as per IS 16444

The supplier should submit the details of source/agencies from whom purchase of various components of meters used by them to the utility/purchaser.

13. **NAME PLATE AND MARKING**

The meter should bear a name plate clearly visible, effectively secured against removal and indelibly/distinctly marked in accordance with relevant IS. In addition, in the middle of the name plate the words "Name of the Utility", purchase order no. & year/month of manufacturing shall either be punched or marked indelibly. The rating plate information shall be as per relevant IS.

14. **CONNECTION DIAGRAM:** As per IS 16444

15. **FIXING ARRANGEMENTS:**

The meter shall be mounted type. The Meter should have three fixing holes, one at top and two at the bottom. The Top hole should be such that the holding screw is not accessible to the consumer after fixing the meters. The lower screws should be provided under sealable terminal cover. The requisite fixing screws shall be supplied with each meter.

16. **SEALING ARRANGEMENT:**

Arrangements shall be provided for proper sealing of the meter cover so that access to the working parts shall not be possible without breaking the seal. The sealing arrangement and number of seals shall be as per relevant IS/ requirement of utility.

17. **METER BOX:** The Meter Box would be provided as per requirement of the

utility/ purchaser.

18. PACKING

The meters shall be suitably packed for vertical/horizontal support to withstand handling during transportation. The meter shall be packed appropriately to ensure safe transportation, handling, identification and storage. All packing materials shall be as per environment law in force. The primary packing shall ensure protection against humidity, dust, grease and safeguard the meter's performance until its installation. The secondary packing shall provide protection during transportation. The packing case shall indicate "Fragile in nature" anddirection of placement of box. Each packing shall indicate marking details like Manufacturer's name, S.No. of meters, quantity etc.

19. TRANSPORTATION

The meter shall be compact in design. The meter block unit shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.

The meter should not be exposed to undue shock and mishandling during transportation. The stacking of box inside transport media should be such as to avoid their free movement. The packing should also be protected from rain and dust by transport media. The Bidder shall be responsible for any damage during transit due to inadequate or improper packing.

20. TESTING AND MANUFACTURING FACILITIES AT MANUFACTURER'S PLACE

The manufacturer shall have NABL accredited laboratory to ensure accurate testing calibration as per IS 13779 for acceptance test.

21. INSPECTION

❖ All meters shall be duly tested and sealed by the firm at their premises prior to inspection. Manufacturer seal may be provided on one side of meter. For the other side, the seal with engrave as Utility name may be sent in a pack for provision by utility after completion of test by the utility & after receipt of the meter.

❖ The utility/ purchaser may i nspect the meter randomly as per sampling plan for acceptance test as per IS 16444. The meters shall be tested for all functional requirements as part of acceptance test as per IS 16444. After testing, these sample meters shall be additionally sealed and would be kept in safe lock for verification if needed.

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Technical Specification of
Three phase whole current Smart
Meter

TECHNICAL SPECIFICATIONS FOR WHOLE CURRENT A.C. THREE PHASE FOUR WIRE SMART ENERGY METER OF ACCURACY CLASS 1.0 WITH Bi DIRECTIONAL COMMUNICATION FACILITY SUITABLE FOR ADVANCED METERING INFRASTRUCTURE (AMI)

1. SCOPE

The specification covers the design, manufacturing, testing, supply and delivery of AC whole current 3 phase 4 wires Smart Energy Meter with bidirectional communication facility. The meter shall be suitable for Advanced Metering Infrastructure (AMI). The meter shall communicate with Data Concentrator Unit (DCU) / Access Point / HES on any one of the communication technologies mentioned in IS16444, as per the requirement of the utility / authorized system integrator.

2. BASIC FEATURES

The Smart Meter would have the following minimum basic features-

- Measurement of electrical energy parameters
- Bidirectional Communication
- Integrated Load limiting switch /relay
- Tamper event detection, recording and reporting
- Power event alarms such as loss of supply, low/ high voltage
- Remote firmware upgrade
- Net metering features
- On demand reading

3. GENERAL STANDARDS APPLICABLE FOR METERS

Unless otherwise specified elsewhere in this specification, the performance and testing

of
the meters shall conform to the following standards with latest amendments thereof:

S.No.	**Standard No.**	**Title**
1	IS 13779 with latest amendments	AC Static Watt-hour Meter class 1& 2
2	IS 16444 with latest amendments	A.C. Static Direct Connected Watt Hour Smart Meter Class 1 and 2- Specification

3	IS 15884 with latest amendments	Alternating Current Direct Connected Static Prepayment Meters for Active Energy (Class 1 and 2)- Specification
4	IS 15959 Part 1 & Part 2 with latest amendments	Data Exchange for Electricity Meter Reading, Tariff and Load Control- Companion Standards

4. COMMUNICATION

Meter shall have ability to communicate with Data Concentrator Unit (DCU) / Access Point / HES on any one of the technologies mentioned in IS16444 in a secure manner, as per the site conditions and as per design requirement of AMI Implementing agency. In case of GPRS/3G/4G based meter, the meter shall accommodate SIM card of any service provider. In case of Plug in type communication module, the meter shall log communication module removal/ non responsive event with snapshot.

4.1 Remote Load control facility would be as per IS 16444.

5. OTHER SPECIFICATIONS

Particulars	**Specification**
Applicable Standards	The meters shall comply with IS 16444 for all requirements. Those parameters which are not covered in IS 16444 have been specifically mentioned in this specification.
Reference Voltage	As per relevant IS
Current Rating	10-60 A /10-100 A (as per the requirement of the utility)
Starting Current	As per IS 16444
Accuracy	Class 1.0 as per IS 16444
Limits of error	As per IS 16444
Operating Temperature range	As per IS 16444
Humidity	As per IS 16444
Frequency	As per IS 16444
Influence Quantities	As per IS 16444
Power Consumption of meter	As per IS 16444
Current and Voltage Circuit	As per IS 16444
Running at No Load	As per IS 16444
Test output device	As per IS 16444

Meter Display	As per IS 16444
Name Plate & marking Meter Display	As per IS 16444
Parameters to be	As per IS 16444 / As per IS 15959 Part-2
Maximum Demand resetting	As per IS 15959 Part-2
Time of Use registers	As per IS 15959 Part-2
Power Quality Information	As per IS 15959 Part-2
LED/LCD Indicators	As per IS 16444
Load Survey/Interval Data	As per IS 15959 Part-2
Tamper/ Event Recording	As per IS 15959 Part-2
Measuring Elements	As per Is 16444
Alarm	As per IS 16444/ As per IS 15959 Part-2
Load Control	As per IS 16444
Connect/Disconnect and status of load switch	As per IS 16444
Programmability	As per IS 16444
Communication	As per IS 16444.
Communication Protocol	As per IS 16444
Remote Firmware upgrade	As per IS 15959 Part-2
Time Synchronization	As per IS 16444/IS 15884 The clock day/date setting and synchronization shall only be possible through password/Key code command from one of the following: • From remote server through suitable communication network. • Hand Held Unit (HHU) or Meter testing work bench and this shall need password enabling for meter; (The methodology for the synchronization would be as per requirement of utility)
Data Retention	As per CEA regulations
Battery Backup	Meter shall be supplied with separate battery backup for RTC.

Guarantee	Manufacturer Shall undertake a guarantee to replace meter up to a period of 60 months from the date of supply. The meter which are found defective/inoperative at the time installation or become inoperative/defective within the guarantee period, these defective/inoperative meters shall be replaced within one month of receipt of report for such defective/inoperative meters
First Breath(Power on) and Last gasp(Power off) condition detection and communication to HES	As per Is 16444

5.1 DATA DISPLAY FACILITY (AUTO/MANUAL)

Data Display shall be in three modes-

1. Auto Scroll
2. Scroll with Push Button
3. High Resolution (Shall display energy values with resolution of 2 digits before decimal and 3 digits after decimal in push button mode)

The display order shall be-

- Auto Scroll
  - Cumulative Active Energy kWh along with legend.
  - Cumulative Energy in kVAh with legend
  - Current calendar month MD in kW with legend.
  - Current calendar month MD in kVAh with legend
  - Instantaneous voltage V_{RN}
  - Instantaneous voltage V_{YN}
  - Instantaneous voltage V_{BN}
  - Instantaneous current I_R
  - Instantaneous current I_Y
  - Instantaneous current I_B

These parameters should be displayed on the LCD/LED continuously for a period of 15 seconds on Auto scroll. In case of power failure, the meter should display above parameters with push button.

- Scroll with Push-button o Internal diagnostics
- o Cumulative kWh
- o Cumulative kVAh
- o Date
- o Real Time
- Voltage V_{RN} (V)
- Voltage V_{YN} (V)
- Voltage V_{BN} (V)
- Current I_R (I)
- Current I_Y (I)
- Current I_B(I)
- Power (kW)
- Power (kVA)
- o Current month MD in kW
- o Current month MD in kVAh
- o Last month cumulative kWh
- o Last month cumulative kVAh
- o Last month MD in kW & occurrence Date
- o Last month MD in kVAh & occurrence Date
- o Average power factor
- o Meter Serial Number

The meter's display should return to default display mode (continues auto scroll) if push button is not operated for more than 10 seconds. (The order of display may be as per the requirement of utility)

6. ANTI TAMPER FEATURES

The meter shall continue recording energy under any temper condition and would log the event and send alarm at Head End System after detection of the defined theft features as per IS 15959 Part 2.

(Optional test as per requirement of utility: The Meter shall be immune under external magnetic influences as per CBIP 325. Meter shall be tested for high voltage discharge (Spark) up to 35KV as per CBIP 325)

7. TESTS

7.1 Type Tests & Test Certificates

Smart meter shall be type tested for all the type tests as per IS: 16444 (latest version) in a third party independent lab. The number of sampling for testing of meters and criteria for conformity would be as per IS 16444.

Necessary copies of test certificates shall be submitted as per agreement with the utility.

7.2 Routine & Acceptance Tests

The Factory Acceptance and Routine tests shall be carried out as per IS 16444. Apart from above test, meter shall also be tested for all functional requirement through communication as part of acceptance test.

8. GENERAL & CONSTRUCTIONAL REQUIREMENTS

8.1 Meter Shall be BIS marked as per IS 16444.

8.2 General & construction requirement shall be as per IS 16444/IS 13779.

8.3 In Home Display(IHD) shall be optional and the specifications of the same would be as per agreement between the bidder and theutility.

9. METER BASE & COVER-

The meter Base & cover shall be as per IS 16444/IS 13779. The meter base and cover break to open design. The material for meter base and cover shall bemade of high grade polycarbonate.

10. **TERMINAL BLOCK & COVER** - As per IS 16444/IS 13779

11. DESIGN

Voltage circuit, sealing arrangement, terminal block, terminal cover and nameplate etc. shall be in accordance with IS-16444 (latest version).

The meter shall be compact and reliable in design, easy to transport and immune to vibration and shock involved in transportation and handling.

12. **CIRCUITRY –** As per IS 16444

The supplier should submit the details of source/agencies from whom purchase of various components of meters used by them to the utility/purchaser.

13. NAME PLATE AND MARKING

The meter should bear a name plate clearly visible, effectively secured against removal and indelibly/distinctly marked in accordance with relevant IS. In addition, in the middle of the name plate the words "Name of the Utility", purchase order no. & year/month of manufacturing shall either be punched or marked indelibly. The rating plate information shall be as per relevant IS.

14. CONNECTION DIAGRAM: As per IS 16444

15. FIXING ARRANGEMENTS:

The meter shall be mounted type. The Meter should have three fixing holes, one at top and two at the bottom. The Top hole should be such that the holding screw is not accessible to the consumer after fixing the meters. The lower screws should be provided under sealable terminal cover. The requisite fixing screws shall be supplied with each meter.

16. SEALING ARRANGEMENT:

Arrangements shall be provided for proper sealing of the meter cover so that access to the working parts shall not be possible without breaking the seal. The sealing arrangement and number of seals shall be as per relevant IS/ requirement of utility.

17. METER BOX: The Meter Box would be provided as per requirement of the utility.

18. PACKING

- The meters shall be suitably packed for vertical/horizontal support to withstand handling during transportation.
- The meter shall be packed appropriately to ensure safe transportation, handling, identification and storage.
- All packing materials shall be as per environment law in force. The primary packing shall ensure protection against humidity, dust, grease and safeguard the meter's performance until its installation.
- The secondary packing shall provide protection during transportation.
- The packing case shall indicate "Fragile in nature" and direction of placement of box.
- Each packing shall indicate marking details like Manufacturer's name, S.No. of meters, quantity etc.

19. TRANSPORTATION

- The meter shall be compact in design. The meter block unit shall be capable of withstanding

stresses likely to occur in actual service and rough handling during transportation.

- The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.
- The meter should not be exposed to undue shock and mishandling during transportation.
- The stacking of box inside transport media should be such as to avoid their free movement.
- The packing should also be protected from rain and dust by transport media.
- The Bidder shall be responsible for any damage during transit due to inadequate or improper packing.

20. TESTING AND MANUFACTURING FACILITIES AT MANUFACTURER'S PLACE

The manufacturer shall have NABL accredited laboratory to ensure accurate testing calibration as per IS 13779 for acceptance test.

21. INSPECTION

❖ All meters shall be duly tested and sealed by the firm at their premises prior to inspection. Manufacturer seal may be provided on one side of meter. For the other side, the seal with engrave as Utility name may be sent in a pack for provision by utility after completion of test by the utility & after receipt of the meter.

❖ The utility/ purchaser may inspect the meter randomly as per sampling plan for acceptance test as per IS 16444. The meters shall be tested for all functional requirements as part of acceptance test as per IS 16444. After testing, these sample meters shall be additionally sealed and kept in a safe lock for verification, if needed.

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Technical Specifications

Technical Specifications for Polycarbonate Meter Cover Box for **Single Phase Meters**

1. SCOPE:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at store/site and performance of single phase meter box intended to contain one number single phase whole current energy meter complete with all accessories for trouble free and efficient operation.

2. APPLICABLE STANDARDS: -

The equipment covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest edition of the following Indian/International standards and shall conform to the regulations of the local statutory authorities.

a)	IS: 14772-2000	General requirements for enclosures for accessories for household and similar fixed electrical installations- specifications.
b)	IS: 11731(Part-II) -1992	Methods of test for determination of Flammability of solid electrical insulating material when exposed to an igniting source.
c)	IS 4249-1967	Specification for classification and method of test for non- ignitable and self-extinguishing properties of solid electrical insulating materials.
d)	IS 5133(Part II)-1969	Specification for boxes for the enclosure of electrical accessories.
e)	IS 2500(Part 1)-2000	Sampling procedure for inspection by attributes part-1 sampling schemes indexed by acceptance quality limit (AQL) for lot by lot inspection.
f)	UL 746-C	Polymeric Materials in Electrical equipment.

3. CLIMATIC CONDITIONS OF THE INSTALLATION:

1.	Max. ambient air temperature	60^0C
2.	Min. ambient air temperature	(-)5^0C
3.	Average Daily Max. ambient temperature	40^0C
4.	Max. yearly weighted average ambient temperature	32^0C
5.	Max. altitude above mean sea level	1000 m
6.	Minimum Relative Humidity (%age)	26
7.	Max. Relative Humidity (%age)	95
8.	Avg. No. of Rainy days/year	120
9.	Avg. annual rainfall	900 mm
10.	Maximum wind pressure	195 kg/m2

The atmosphere is generally laden with mild acid and dust particles suspended during dry months and subjected to fog in cold months. The design of the equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1g.

4. GENERAL TECHNICAL REQUIREMENTS:

SI. No	DESCRIPTION	REQUIREMENT
1.	Application	Outdoor

2	Degree of protection	IP 55
3	Flammability requirement	FVo
4	Grade of material	Polycarbonate with fire retardant, Self-Extinguishing, UV stabilized and anti-oxidation properties.
5	Material a) Base: b) Cover:	The meter box (base and Cover) shall be made of polycarbonate material which complies following properties; Meter box shall be weather proof, capable to withstanding temperatures of boiling water for 5 minutes continuously without distortion or softening. It shall withstanding Glow wire test at 6500C as per IS : 14772. Polycarbonate Lexan 943 A or equivalent Grade with dark grey color. Polycarbonate Lexan 943 A or equivalent Grade with Transparent configuration.
6	Material of the gasket	Rubber gasket
7	Material withstand temperature.	125 Deg C ± 2 Deg C

5. GENERAL CONSTRUCTIONS:

5.1 The meter box shall be weather proof, tamper proof and shall be made of Injection moulded polycarbonate material with self-extinguishing, UV stabilized, recyclable and Anti oxidation properties. The box shall be of adequate strength, unbreakable and shall be made in two pieces (base and cover).The base shall be dark grey color whereas the cover shall be completely transparent.

The meter Box shall have roof tapering down to both the sides for easy flow of rainwater.

The thickness of the box shall not be less than 3mm on the load bearing side and other sides, door and roof shall not be less than 2.5 mm.

The box shall be designed in such a way that there should be the following clearances between the meter and the Meter box:

Between Sides of the meter body and meter box – 30 mm minimum (excluding the flanges on the meter body for sealing screws.)

Between the lower edge of the terminal block and the Meter box – 70 mm Minimum

Between the back of the meter and the meter box base – 10 mm Minimum

Between the top of the meter and the meter box cover – 20 mm Minimum

The meter box shall have a taper roof for easy flow of rain water and shall have degree of protection IP 55 for affording protection against dust & water.

5.2 The meter base supports inside the box should have adequate strong enough molded supports within the block to avoid damage during tightening of screws and raised by about 10 mm in the box for ease of wiring. While fixing, the meter screws should not protrude outside.

5.3 The design of the meter box shall be such that it may facilitate easy wiring and access to the meter terminals. Nylon gland of internal diameter of approx. 20 mm shall be provided for I/C and O/G cables of size 2C x 16 sq. mm or as approved by the EESL.

5.4 The box cover shall be fixed to the base through two number hinges (approx length 30 - 60 mm). The arrangement for hinges shall be provided on the side of the base and shall be such that it may avoid unauthorized access to inside of the box. Hinges should be outside and enclosed by polycarbonate material and once the box is closed and sealed, hinges should not be approachable. Box cover shall be openable by more than 90 degrees.

5.5 For holding and sealing the box, two U-shaped latches shall be provided. The latch shall be GI sheet with minimum thickness 2 mm, to secure it with the base of the box.. The latch shall be provided along with suitable clamp assembly in base as well as cover, such that these are fully covered by the latch after closing. The clamp along with the latch shall have a sealing hole such as to provide a through sealing arrangement in the assembly.

5.6 For fixing the box to flat wall or wooden board 4Nos. holes (2Nos.key holes at top) of minimum 6 mm dia. shall be provided at the four corners of the meter box. For fixing of Box on flat wall, 4 Nos. 5mm diameter 40mm long pan head self- taping screws and washers shall be provided by the supplier with every Box. 4 Nos. plastic fixing plugs of 50mm length suitable for self-tapping screws shall also be provided (Fixing clamp and accessories for pole mounting/ wall mounting, shall be in the scope of Agency, who shall be installing the meters in the field based on the actual site conditions & pole sizes. These are not to be supplied with the boxes).

5.7 Push button arrangement shall be required on the cover of the box to operate the meter display push button from outside the meter box to read the meter display parameters without opening the meter box cover.

5.8 A provision in form of depression should be provided on the meter box cover to download the meter data from the meter using the CMRI probe without opening the meter box cover. This shall be provided in such a way that the optical probe of the CMRI cable can be placed on top of the meter box cover in a suitable depression in the meter box cover which is aligned suitably with the meter optical port. Also the meter box cover shall have provision of sealing this depression. The depression so provided should be covered so that there is no physical access to the meter optical port while using this depression.

5.9 Suitable rubber gasket of round shape all around the cover along its periphery shall be provided for protection.

5.10 After closing and sealing the meter box, it should not be possible to allow entry of any sharp object even forcefully inside the box without breaking base/cover. Suitable overlapping (approx 10 mm) shall be provided between base and cover to avoid access to the meter or its accessories inside the meter box by any means after sealing the box.

5.11 The tolerance permissible in overall dimension of MCB shall be +/- 2%.

6.0 NAME PLATE AND MARKING:

The equipment shall be provided with durable and legible name plate, effectively secured against its removal under any circumstances, so far as possible. Name plate shall be embossed with "PO/ Work Order No with date", "NAME OF DISCOM". The name plate shall be indelibly and distinctly marked with all essential particulars as per the relevant standards along with the following information:

a) Manufacturer's name
b) Serial number
c) Month and Year of manufacture

6. Tests: All routine acceptance & type tests shall be carried out in accordance with the relevant IS/IEC. All routine & acceptance tests shall be witnessed by the EESL/DISCOMs authorized representative(s). All the components shall also be type

tested as per the relevant standards. Following tests shall be necessarily conducted on the meter box in addition to others as specified in IS/IEC standards.

7. Type test:

Sr. No.	Test/Standard	Requirement
1.	Protection against electric shock (IS:14772 -2000)	Enclosure shall be so designed that when it is mounted for normal use, the live parts of any correctly installed accessories or any parts of these accessories which may become live due to a fault shall not be accessible.
2.	Resistance to ageing, humid conditions, Ingress of solid objects and to harmful ingress of water (IS:14772 -2000)	Resistance to Ageing: Enclosure shall be kept in a heating cabinet with temp 70 ±2 C° for 7 days as per IS. After completion of the test, the enclosure shall not show any cracks. **Humid conditions:** Enclosure shall be kept in a cabinet with humidity between 91 to 95 % for 7 days as per IS. After completion of the test, enclosure shall not show any damage. **Resistance against ingress of solid objects and to harmful ingress of water:** Enclosure shall be subjected to test for degree of protection (IP 55) as per IS 12063.
3.	Mechanical strength/Impact Resistance Test (IS:14772 2000)/(UL:746C)	The sample shall be subjected to Impact resistance test as per the respective standards and shall not show occurrence of any of the following: 1.Making uninsulated live parts accessible to contact. 2. Producing a condition that might affect the mechanical performance of the enclosure. 3. Producing a condition that would increase the likelihood of an electric shock.
4.	Resistance to heat /Ball Pressure Test (IS:14772 -2000)	The test shall be made on one sample in a heating cabinet at a temp of 125 ±2°C as per IS. After completion of test , the diameter of the impression caused by the ball shall be measured and should not exceed 2 mm.
5.	Resistance to Abnormal heat and fire/ Glow wire test (IS: 14772-2000)	Parts of insulating materials which might be exposed to thermal stresses due to electric effects shall not be affected by abnormal heat and by fire. The compliance shall be checked by means of the glow wire test performed at 650°C, according to IS 11000 (Part 2/section 1) with no flame and glowing.
6.	Resistance to Tracking (IS 14772-2000)	The sample when tested as per clause no 17 of IS: 14772, shall show no flashover after completion.
7.	Flammability test (IS:.11731(Part II) 1986)/UL:94)	The sample shall comply to flammability requirements of category FVO/ Vo as per respective standards.
8.	Test for self-extinguishing Property (IS:4249-1967)	The sample when tested as per clause 3.5.1 of IS 4249 shall comply to the specified requirements.
9.	Test for water absorption (IS:5133 (Part-II)-1969)	The sample shall be heated to a temperature of 50±3°C for 24 hours, as per IS and after completion, the water content absorbed should not be more than 1%.