RFQ No.: CC24VKD032

OPEN TENDER NOTIFICATION

FOR

OUTLINE AGREEMENT FOR SUPPLY AND INTEGRATION OF SMART METERS WITH HEAD END SYSTEM AND METER DATA MANAGEMENT SYSTEM

Tender Enquiry No.: CC24VKD032

Due Date for Bid Submission: 26.03.2024 [17:00 Hrs.]

The Tata Power Company Limited
Mumbai, Maharashtra

RFQ No.: CC24VKD032

CONTENTS OF THE ENQUIRY

1.0 Event Information

1.1 Scope of work

Open Tenders are invited in e-tender bidding process from interested Bidders for entering into a Outline Agreement valid for a period of 3 Years as defined below:

S. No.	Description	EMD Amount (Rs.)	Tender Fee (Rs.)
1	**1.5 -Year Rate Contract for Supply and Integration of Smart Meters with Head End System and Meter Data Management System.**	10,00,000/-	2,000/-

1.2 Availability of Tender Documents

Non-transferable tender documents may be purchased by interested eligible bidders from the address given below on submission of a written application to the thunder-mentioned and upon payment of a non-refundable Tender fee.

Chief (Corporate Contracts)
The Tata Power Company Limited
Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station
Sahar Airport Road, Andheri East, Mumbai-400059

Tender documents may be downloaded by interested eligible bidders from the TPC website www.tatapower.com with effect from 04.03.2024. In the event, detailed tender documents are downloaded the from TPC website or are received through email from TPC, the Tender Fee shall be compulsorily submitted online through NEFT/ RTGS in favor of "The Tata Power Company Limited". Any such bid submitted without this Fee shall be rejected.

Bidders are requested to visit TPC website www.tatapower.com regularly for any modification/ clarification to the bid documents. For Limited Tenders issued by TPC, the tender document shall be shared through e-mail as the case may be.

1.3 Calendar of Events

(a)	Date of availability of tender documents from TPC Website	From 04.03.2024 to 26.03.2024, 17:00 Hrs
(b)	Date & Time of Pre-Bid Meeting (If any)	NA
(c)	Last Date of receipt of pre-bid queries, if any	11.03.2024 up to 17:00 Hours
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	15.03.2024 up to 17:00 Hours
(e)	Last date and time of receipt of Bids	26.03.2024 up to 17:00 Hrs
(f)	Date & Time of opening of Price of qualified bids	Will be notified to the successful bidders through our website/e-mail.

Note :- In the event of last date specified for submission of bids and date of opening of bids is declared as a closed holiday for TPC Mumbai office, the last date of submission of bids and date of opening of bids will be the following working day at appointed times.

1.4 Mandatory documents required along with the Bid

1.4.1 EMD of requisite value and validity
1.4.2 Tender Fee in case the tender is downloaded from website
1.4.3 Requisite Documents for compliance to Qualification Criteria mentioned in Clause 1.7.
1.4.4 Drawing, Type Test details along with a sample of each item as specified at Annexure I (as applicable)
1.4.5 Duly signed and stamped 'Schedule of Deviations' as per Annexure III on bidder's letter head.
1.4.6 Duly signed and stamped 'Schedule of Commercial Specifications' as per Annexure IV on bidder's letter head.
1.4.7 Proper authorization letter/ Power of Attorney to sign the tender on the behalf of bidder.
1.4.8 Copy of PAN, GST, PF and ESI Registration (In case any of these documents is not available with the bidder, same to be explicitly mentioned in the 'Schedule of Deviations')

Please note that in absence of any of the above documents, the bid submitted by a bidder shall be liable for rejection.

1.5 Deviation from Tender

Normally, the deviations to tender terms are not admissible and the bids with deviation are liable for rejection. Hence, the bidders are advised to refrain from taking any deviations on this Tender. Still in case of any deviations, all such deviations shall be set out by the Bidders, clause by clause in the 'Annexure III - Schedule of Deviations' and same shall be submitted as a part of the Technical Bid.

1.6 Right of Acceptance/Rejection

Bids are liable for rejection in absence of following documents:-

1.6.1 EMD of requisite value and validity
1.6.2 Tender fee of requisite value
1.6.3 Price Bid as per the Price Schedule mentioned in Annexure-I
1.6.4 Necessary documents against compliance to Qualification Requirements mentioned at Clause 1.7 of this Tender Document.
1.6.5 Filled in Schedule of Deviations as per Annexure III
1.6.6 Filled in Schedule of Commercial Specifications as per Annexure IV
1.6.7 Receipt of Bid within the due date and time

TPC reserves the right to accept/reject any or all the bids without assigning any reason thereof.

1.7 Pre- Qualification Criteria As per Annexure - A

Marketing Integrity

We have a fair and competitive marketplace. The rules for bidders are outlined in the General Conditions of Contracts. Bidders must agree to these rules prior to participating. In addition to other remedies available, TPC reserves the right to exclude a bidder from participating in future markets due to the bidder's violation of any of the rules or obligations contained in the General Condition of Contracts. A bidder who violates the marketplace rules or engages in behavior that disrupts the fair execution of the marketplace may result in restriction of a bidder from further participation in the marketplace for a length of time, depending upon the seriousness of the violation. Examples of violations include, but are not limited to:

- Failure to honor prices submitted to the marketplace
- Breach of terms as published in TENDER/ NIT

1.8 Supplier Confidentiality

All information contained in this tender is confidential and shall not be disclosed, published or advertised in any manner without written authorization from TPC. This includes all bidding information submitted to TPC. All tender documents remain the property of TPC and all suppliers are required to return these documents to TPC upon request. Suppliers who do not honor these confidentiality provisions will be excluded from participating in future bidding events.

2.0 Evaluation Criteria

- The bids will be evaluated technically on compliance with tender terms and conditions.
- The bids will be evaluated commercially on each type all-inclusive value & based on recommendation by the engineering team of Tata Power. TPC however, reserves the right to award the contract. Hence all bidders are advised to quote their most competitive rates against each line item for each zone.
- Bidder has to mandatorily quote against each item of the Schedule of Items *[Annexure I].* Failing to do so, TPC may reject the bids.

NOTE: In case of a new bidder not registered, factory inspection and evaluation shall be carried out to ascertain bidder's manufacturing capability and quality procedures. However TPC reserves the right to carry out factory inspection and evaluation for any bidder prior to technical qualification. In case a bidder is found as Disqualified in the factory evaluation, their bid shall not be evaluated any further and shall be summarily rejected. The decision of TPC shall be final and binding on the bidder in this regard.

2.1 Price Variation Clause:

The prices shall remain firm during the entire contract period.

3.0 Submission of Bid Documents

3.1 Bid Submission

Bidders are requested to submit their offer in line with this Tender document. TPC shall respond to the clarification raised by various bidders and the replies will be sent to all participating bidders through e-mail.

Bids shall be submitted in 3 (Three) parts:

FIRST PART: "EMD" of Rs. 10,00,000/- (Rupees Ten Lakhs only) shall be submitted. The EMD shall be valid for 210 days from the due date of bid submission in the form of BG / Bankers Pay Order favoring "The Tata Power Company Limited". The EMD has to be strictly in the format as mentioned in General Condition of Contract, failing which it shall not be accepted and the bid as submitted shall be liable for rejection. A separate non-refundable tender fee the of stipulated amount also needs to be transferred online through NEFT/ RTGS in case the tender document is downloaded from our website.

TPC/ TPC Bank Details for transferring Tender Fee and EMD is as below:

Account Name: The Tata Power Co. Ltd.
Bank Name: HDFC Bank, Fort Branch, Mumbai
Bank Account No. : 00600110000763

IFSC Code: HDFC0000060

SECOND PART: "TECHNICAL BID" shall contain the following documents:

a) Documentary evidence in support of qualifying criteria
b) Technical literature/GTP/Type test report etc. *(if applicable)*
c) Qualified manpower available
d) Testing facilities *(if applicable)*
e) No Deviation Certificate as per the Annexure III – Schedule of Deviations
f) Acceptance to Commercial Terms and Conditions viz Delivery schedule/period, payment terms etc. as per the Annexure IV – Schedule of Commercial Specifications.
g) Quality Assurance Plan/Inspection Test Plan for supply items *(if applicable)*

The technical bid shall be properly indexed and is to be submitted in Soft Copy through Ariba Portal only. Hard Copy of Technical Bids need not be submitted.

THIRD PART: "PRICE BID" shall contain only the price details and strictly in format as mentioned in Annexure I along with explicit break up of basic prices, Taxes & duties, Freight etc. In case any discrepancy is observed between the item description stated in Schedule of Items mentioned in the tender and the price bid submitted by the bidder, the item description as mentioned in the tender document (to the extent modified through Corrigendum issued if any) shall prevail.

FOR BIDS INVITED THROUGH E-PROCUREMENT PORTAL:

The interested bidders are requested to obtain user name and password for purpose of bid submission through Ariba portal of TPC, Mumbai

Bids have to be mandatorily submitted only through Ariba portal of TPC. Bids submitted through any other form/ route shall not be admissible

The EMD in the form of BG shall be submitted in original hard copy and then placed in sealed envelope which shall be clearly marked as below:

EMD

" Rate Contract for Supply and Integration of Smart Meters with Head End System and Meter Data Management System."

Please mention our Enquiry Number:- CC24VKD032 on the Tender and drop the same at The Tata Power Company Limited, Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station, Sahar Airport Road, Andheri East, Mumbai-400059.

The envelope shall be addressed to:

Chief (Corporate Contracts)
The Tata Power Company Limited
Smart Center of Procurement Excellence, 2nd Floor, Sahar Receiving Station
Sahar Airport Road, Andheri East, Mumbai-400059

The envelope shall also bear the Name and Address of the Bidder along with our Tender No. and subject.

SIGNING OF BID DOCUMENTS:

The bid must contain the name, residence and place of business of the person or persons making the bid and must be signed and sealed by the Bidder with his usual signature. The names of all persons signing should also be typed or printed below the signature.

The Bid being submitted must be signed by a person holding a Power of Attorney authorizing him to do so, certified copies of which shall be enclosed.

The Bid submitted on behalf of companies registered with the Indian Companies Act, for the time being in force, shall be signed by persons duly authorized to submit the Bid on behalf of the Company and shall be accompanied by certified true copies of the resolutions, extracts of Articles of Association, special or general Power of Attorney etc. to show clearly the title, authority and designation of persons signing the Bid on behalf of the Company. Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the bid.

A bid by a person who affixes to his signature the word 'President', 'Managing Director', 'Secretary', 'Agent' or other designation without disclosing his principal will be rejected.

The Bidder's name stated on the Proposal shall be the exact legal name of the firm.

3.2 Contact Information

All the bidders are requested to send their pre-bid queries (if any) against this tender through e-mail within the stipulated timelines. The consolidated reply to all the queries received shall be shared on respective registered mail ID by the stipulated timelines as detailed in calendar of events.

Communication Details:

Contracts – T&D

Name: Ms Vaishali Kachare
Contact No: 022- 67173930
E-Mail ID: vaishali.kacharel@tatapower.com

Group Head Contracts – T&D:

Name: Mr. Selva Ganesh S P
Contact No.: 022- 67173925
E-Mail ID: selva.ganesh@tatapower.com

3.3 Bid Prices

Bidders shall quote for the entire Scope of Supply/ work with a break up of prices for individual items and Taxes & duties. The bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total price with taxes, duties & freight up to destination at various sites of TPC. The all-inclusive prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during the execution of the supply work, breakup of price constituents.

The quantity break up shown else-where other than Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated in the price schedule but which are required to complete the job as per the Technical Specifications/ Scope of Work/ SLA mentioned in the tender, shall be deemed to be included in prices quoted.

3.4 Bid Currencies

Prices shall be quoted in Indian Rupees Only.

3.5 Period of Validity of Bids

Bids shall remain valid for 180 days from the due date of submission of the bid.

Notwithstanding clause above, the TPC may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and responses thereto shall be made in writing.

3.6 Alternative Bids

Bidders shall submit Bids, which comply with the Bidding documents. Alternative bids will not be considered. The attention of Bidders is drawn to the provisions regarding the rejection of Bids in the terms and conditions, which are not substantially responsive to the requirements of the bidding documents.

3.7 Modifications and Withdrawal of Bids

The bidder is not allowed to modify or withdraw its bid after the Bid's submission. The EMD as submitted along with the bid shall be liable for forfeiture in such event.

3.8 Earnest Money Deposit (EMD)

The bidder shall furnish, as part of its bid, an EMD amounting as specified in the tender. The EMD is required to protect the TPC against the risk of bidder's conduct which would warrant forfeiture.
The EMD shall be denominate in any of the following form:

- Banker's Cheque/ Demand Draft/ Pay order drawn in favor of The Tata Power Company Limited, payable at Mumbai.
- Online transfer of requisite amount through NEFT/ RTGS.
- Bank Guarantee valid for 210 days after due date of submission.

The EMD shall be forfeited in case of:

a) The bidder withdraws its bid during the period of specified bid validity.

Or

b) The case of a successful bidder, if the Bidder does not
i) accept the purchase order, or
ii) furnish the required performance security BG

3.9 Type Tests (if applicable)

As per attached Annexures

4.0 Bid Opening & Evaluation process

4.1 Process to be confidential

Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the TPC's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

4.2 Technical Bid Opening

Bids will be opened at TPC Office Mumbai as per the schedule mentioned in Calendar of Events. In case of limited tenders, the bids shall be opened internally by TPC. In case of Open Tenders, the bids shall be opened in the presence of accredited representatives of bidders who may choose to be present at the time of tender opening. Technical bid must not contain any cost information whatsoever.

First the envelope marked "EMD" will be opened. Bids without EMD/cost of tender (if applicable) of required amount/ validity in prescribed format, shall be rejected.

Next, the technical bid of the bidders who have furnished the requisite EMD will be opened, one by one. The salient particulars of the techno commercial bid will be read out at the sole discretion of TPC.

4.3 Preliminary Examination of Bids/Responsiveness

TPC will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order. TPC may ask for submission of original documents in order to verify the documents submitted in support of qualification criteria.

Arithmetical errors will be rectified on the following basis: If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the

Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

Prior to the detailed evaluation, TPC will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

Bid determined as not substantially responsive will be rejected by the TPC and/or the TPC and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

4.4 Techno Commercial Clarifications

Bidders need to ensure that the bids submitted by them are complete in all respects. To assist in the examination, evaluation and comparison of Bids, TPC may, at its discretion, ask the Bidder for a clarification on its Bid for any deviations with respect to the TPC specifications and attempt will be made to bring all bids on a common footing. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted owing to any clarifications sought by TPC.

4.5 Price Bid Opening

Price bids will be opened at the stipulated date and time. The EMD of the bidder withdrawing or substantially altering his offer at any stage after the technical bid opening will be forfeited at the sole discretion of TPC without any further correspondence in this regard.

4.7 Reverse Auctions

TPC reserves the right to conduct the reverse auction (instead of public opening of price bids) for the products/ services being asked for in the tender. The terms and conditions for such reverse auction events shall be as per the Acceptance Form attached as Annexure VI of this document. The bidders along with the tender document shall mandatorily submit a duly signed copy of the Acceptance Form attached as Annexure VI as a token of acceptance for the same.

5.0 Award Decision

TPC will award the contract to the successful bidder whose bid has been determined to be the lowest-evaluated responsive bid as per the Evaluation Criterion mentioned in Clause 2.0. The Cost for the said calculation shall be taken as the all-inclusive cost quoted by the bidder in Annexure I (Schedule of Items) subject to any corrections required in line with Clause 4.3 above. The decision to place a purchase order/LOI solely depends on TPC on the cost competitiveness across multiple lots, quality, delivery, and bidder's capacity, in addition to other factors that TPC may deem relevant.

TPC reserves all the rights to award the contract to one or more bidders so as to meet the delivery requirement or nullify the award decision without assigning any reason thereof.

In case any supplier is found unsatisfactory during the delivery process, the award will be canceled and TPC reserves the right to award other suppliers who are found fit.

6.0 Order of Preference/Contradiction:

In case of contradiction in any part of various documents in the tender, the following shall prevail in order of preference:

1. Schedule of Items (Annexure I)
2. Technical Specifications/ Scope of Work and SLA (Annexure II)
3. Schedule of Commercial Specifications (Annexure III)

4. Schedule of Deviations (Annexure IV)
5. Document Check List (Annexure V)
6. Acceptance Form for Participation in Reverse Auction (Annexure VI)
7. Inspection Test Plan (Annexure VII)
8. General Conditions of Contract (Annexure VIII)
9. BG Format (Annexure IX)

7.0 Post Award Contract Administration

7.1 Special Conditions of Contract

- The rate shall remain FIRM till the validity of the Rate Contract.
- TPC appreciates and welcomes the engagement/employment of persons from SC/ ST community or any other deprived section of society by their BAs.
- Any change in statutory taxes, duties, and levies during the contract period shall be borne by TPC. However, in case of delay in work execution owing to reasons not attributable to TPC, any increase in total liability shall be passed on to the Bidder, whereas any benefits arising owing to such statutory variation in taxes and duties shall be passed on TPC.
- All the terms and conditions of TPC GTC shall be applicable.

7.2 Drawing Submission & Approval

As per Annexure - II

7.3 Contract Period

1.5 years from the date of award of OLA.

7.4 Warranty Period

As per Specifications / Job Scope

7.5 Payment Terms as per Annexure

The Payment terms shall be as follows:

The payment in the first lot would be split into Delivery & integration as 80:20. After successful integration, data flow to HES, and subsequent lots payment shall be released at 100% on delivery with a credit period for both cases as 90 days from the submission of error-free invoice.

Payment Terms (I Lot)

- 80% of on a pro-rata basis on receipt of material at the site (with 100% taxes and duties)

- 20% of Meter Cost with NIC shall be paid after successful Installation, integration with the HES system & uploading of (for the first lot of 1000 meters) a minimum of three (3) continuous months of meter reading data with 90% communication on the HES system.

Payment Terms (Subsequent Lots)

- 100% of on a pro-rata basis on receipt of material at site.

7.6 Liquidated Damages

As per the Tata Power General Terms and Conditions shall be applicable.

7.7 Contract Performance Bank Guarantee (CPBG)

Contract Performance Bank Guarantee (CPBG) cum Performance Bank Guarantee 10% of the total order value within 15 days of award of contract valid till the contract period and claim period.

7.8 SLA / Performance Requirement and penalties -AS per Scope of Work.

7.9 Safety Retention

Safety Retention as per the Tata Power General Terms and Conditions shall be applicable and shall be released based on the safety performance score after work completion.

7.10 Climate Change

Significant quantities of waste are generated during the execution of the project and an integrated approach for effective handling, storage, transportation, and disposal of the same shall be adopted. This would ensure the minimization of environmental and social impact in order to combat climate change.

7.11 Ethics

TPC is an ethical organization and as a policy TPC lays emphasis on ethical practices across its entire domain. Bidder should ensure that they should abide by all the ethical norms and in no form either directly or indirectly be involved in unethical practice.

TPC work practices are governed by the Tata Code of Conduct which emphasizes on the following:

- We shall select our suppliers and service providers fairly and transparently.
- We seek to work with suppliers and service providers who can demonstrate that they share similar values. We expect them to adopt ethical standards comparable to our own.
- Our suppliers and service providers shall represent our company only with duly authorized written permission from our company. They are expected to abide by the Code in their interactions with, and on behalf of us, including respecting the confidentiality of information shared with them.
- We shall ensure that any gifts or hospitality received from, or given to, our suppliers or service providers comply with our company's gifts and hospitality policy.
- We respect our obligations on the use of third-party intellectual property and data.

Bidder is advised to refer GTC attached at Annexure VIII for more information.

Any ethical concerns with respect to this tender can be reported to the following e-mail ID: mrpatel@tatapower.com.

8.0 Specification and standards

As per Annexure II.

9.0 General Condition of Contract

Any condition not mentioned above shall be applicable as per GCC for Supply attached along with this tender at Annexure IX.

10.0 Safety

Safety related requirements as mentioned in our safety Manual put in the Company's website which can be accessed by:

http://www.tatapower.com

All Associates shall strictly abide by the guidelines provided in the safety manual at all relevant stages during the contract period.

RFQ No.: CC24VKD032

Pre- Qualification Criteria - Annexure A

Sr No	Parameter	Tata Power Requirement9	Documents to be submitted by Bidder
		Bidder should be Meter Manufacturer and should meet all criteria pertaining to meter manufacturing. Bidder has to integrate their meters to Tata Power existing UHES system.	
	General Pre-Qualification Requirements (OEM)		
1		The Bidder must be a single entity having at least one permanent establishment of its own office in India and registered in India under companies Act 1956 or Companies Act 2013, or firm registered with Registrar of firms and societies in India who fulfills the eligibility criteria.	Certificate of Incorporation and Registration certificate along with Memorandum & Articles of Association.
2		Minimum Average annual turnover of **Rs. 70 Crores** for the last three financial years ending 31st March 2023.	Turnover certificate by CA.Profit and Loss Statements, Balance Sheet, Cash Flow Statements for the Three (3) preceding financial years duly audited and approved by Authorized Audit Firm / CA
	Pre-Qualification Requirements for Meter Manufacturer (OEM)		
1	Technical Experience - Meter Manufacturer	Bidder(s) should be in the business of manufacturing Static Energy Meters/Smart meter and should have state of the art facility in India. Should be in this Business from the last 5 years in India as on date of Bid Submission.	Factory License Certificate/ MoA mentioning nature of Business.
		The bidder should have manufactured & supplied 2Lakh (Quantity) Number of Smart Meters in last 3 years as on original bid submission date. Out of which, minimum of 50,000 (Quantity) of Smart Meter should have been in satisfactory commercial operation with remote communication for a minimum period of 2 years as on the original bid submission date.	Individual Client's PO/ WO/ LOI/ LOA/ Contract/ Certification on client letterhead. Performance certificates and contact details of client's needs to be submitted
3	In-house Testing Facility	The bidder should have in-house fully automatic smart meter testing Facility for last 3 years.	A valid registration certificate mentioning issue / renewal / expiry date
4	Capacity	Bidder(s) should have experience of manufacturing capacity of smart electricity Meters. All the below criteria are to be fulfilled-	Proof of Work order & performance certificate/ work order completion certificate to be submitted.
		• Minimum of 2 Lac Single Phase Smart Meters per annum	
		• Minimum 1 Lac Three Phase Smart Meter per annum.	
		• Minimum 10,000 LTCT Smart Meter per annum.	
5	Experience with Tata Power existing HES	Vendor supplied Meter should be able to work with TPC Smart Meter	Self-undertaking by the Bidder regarding the integration with UHES and or MDM based on solution.

RFQ No.: CC24VKD032

ANNEXURE I

Price Bid format:

Sr No	Item Description				
A	**Supply of Smart Meters with NIC**	**UOM**	**Qty**	**Unit Price**	**Total Basic Value**
1	Single Phase 10-60A Whole Current Smart Meter with NIC	EA	78,500		-
2	Three Phase 10-100A Whole Current Smart Meter with NIC	EA	20,000		-
3	Three Phase -/5A LTCT Smart Meter with NIC	EA	1,500		-
	Total Basic Price				
	GST@___%				
	Total all Incl Price				

- Note: Above Quantities are tentative. Tata Power reserves the right to curtailed / enhance the quantities before the placement of Purchase Order.
- The bidders are advised to quote prices strictly in the above format and for all the line items as mentioned above. Failing to do so, bids are liable for rejection.
- The bidder must fill each column of the above format. Mentioning “extra/inclusive” in any of the column may lead for rejection of the price bid.
- No cutting/ overwriting in the prices is permissible.
- The unit price to be indicated in col. No.5 should be exclusive of taxes & duties which are to be indicated in separate columns meant for the purpose.

ANNEXURE II
Technical Specifications/ Job Scope & SLA

TECHNICAL SPECIFICATION

FOR

Single Phase

Class 1, 10/60 Amp,

Smart Whole Current Meter

Tata Power Company Ltd.

Meter management Department

Dharavi Receiving Station,

Matunga,

Mumbai – 400 019

Document No.	TPC\MTL\Single Phase\2019\01	Issue No.	01
		Issue Date	25.09.2019
Revision No.	04	Revision Date	28.02.2024
Description	Prepared By & Date	Reviewed By & Date	Approved By & Date
SPECIFICATION FOR SINGLE PHASE SMART DLMS METER	Himali Patel	Rahul Ranadive & Devanjan Dey	S V Savarkar

Revision Summary

Revision No.	Revision Details	Revision Date	Reviewed & Approved By
01	Clause No. 4.31, 4.32, 12.4, 12.7 is modified to include common BCS compatibility, various program feature, load limit profile.	15.10.2020	N Manjunath J S Wadhwa
02	Modified/ Added DIP(Demand Integration Period) and SIP(Survey Integration Period), Latest IS no., Power consumption limit, Change of display sequence through firmware, Additional display sequence for Net meter and LT 2 part, self diagnostics list for LCD segment check, RTC limit, RTC sync, KVAH logic availability in BCS, NIC with 4G LTE with fallback to 2G, measuring element in Phase and neutral circuit, Logging of load switch, UC1 category, NIC module design and integration removed from meter specs, Magnetic tamper, ESD tamper, ND tamper, single wire tamper, Nomenclature for events, compartment size, tamper threshold table, optical port with metallic, encapsulated design of meter body, TPC hologram seal to vendor, Meter category in nameplate, pre dispatch inspection, meter guarantee as 60 months, CAPA of defective meter, latent defect.	08.06.2022	Devanjan Dey S V Savarkar
03	Modified Internal diameter & creepage distance, Communication module with NBIOT added, metallic optical port added, display sequence modified, meter guarantee modified as 120 months and loading factor is added for meter guarantee, defective meter CAPA format is added, GPS tracking system, NIC card module position added.	18.07.2023	Rahul Ranadive & S V Savarkar
04	Modified Meter guarantee as 60 months from 120 months, Load survey days as 35 days, Midnight energies as 35 days. Requirement of GPS tracking is removed.	28.02.2023	Rahul Ranadive/Devanjan Dey & S V Savarkar

Contents

1 Scope:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at store/site of LT Single phase Two Wire, 10-60 A static meters of accuracy class 1.0, with inbuilt load switch and a two way communication with Head End System (HES) (here after referred as meters) complete with all accessories for efficient and trouble free operation.

2 Applicable Standards:

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

a) IS 16444 Part-1 (2015) : A.C. Static Direct connected Watt hour Smart meter class 1.0 and 2.0
b) IS 13779 (2020) :A.C. Static Watt hour meter class 1.0 and 2.0
c) IS 15884 (2010) : A.C. direct connected static prepayment meters for active energy (CL 1 & 2)
d) IS 15959(Part 1-2011) : Data exchange for electricity meter reading, tariff and load control
e) IS 15959(Part 2-2016) : Data exchange for electricity meter reading , tariff and load control
f) IEEE 802.15.4(2003) : Standard for local and metropolitan area networks
g) IS 9000 : Basic Environmental testing procedure for electrical and electronic items.
h) IS 12346 (1999) : Specification for testing equipment for A.C.Electrical energy meter.
i) IS11000 (1984) : Fire hazard testing
j) IEC 62052-11 *(2003)* :Electricity Requirements (AC) General Requirements Tests and Test conditions for A.C.Static Watt hour meter for active energy Class 1.0 and 2.0.
k) IEC 62053-21 (2003) : A.C.Static Watt hour meter for active energy Class 1.0 and 2.0
l) IS 15707 (2006) : Testing Evaluation installation and maintenance of AC Electricity Meters- Code of practice.
m) IEC 60068 : Environmental testing.
n) CBIP – TR No.325 : Specification for A.C.Static Electrical Energy Meters (latest amendment).
o) CEA Regulation (2006) : Installation and operation of meters Dtd: 17/03/2006.
p) IS 60529 : Degree of protection provided by enclosure

3 Climatic Conditions of The Installation:

a) Max. Ambient Temperature : 50 deg.C
b) Max. Daily average ambient temp. : 40 deg.C
c) Min Ambient Temp : 0 deg C
d) Maximum Humidity : 95%
e) Minimum Humidity : 10%
f) Average No. of thunderstorm days per annum : 50
g) Maximum Annual Rainfall : 1450 mm
h) Average No. of rainy days per annum : 60

i) Rainy months : June to Oct.
j) Altitude above MSL not exceeding : 300 meters
k) Wind Pressure : 150 kg/sq m

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.3 g.

4 General Technical Requirements:

S.No.	DESCRIPTION	REQUIREMENT
4.1	Type of the meter	Single phase two wire , whole current meter- direct reading type without application of any multiplication constant. It also Consists of measuring elements, TOU of register, Display, load switch and plug in type bi-directional communication module all integral within the meter.
4.2	Accuracy Class of the meter	1.0
4.3	Basic Current (Ib) & rated Maximum current (Imax)	Ib= 10A; Imax= 60 Amps (Meter shall be able to continuously carry 120% of Imax Meet the accuracy requirements)
4.4	Reference Conditions for testing the performance of the meter	Vref = 240 V $\pm$ 1 % Frequency = 50 Hz $\pm$ 0.3% Temperature= 27 ^{0}C $\pm$ 2 ^{0}C (if the tests are made at the temperature other than reference temperature the results shall be corrected by applying Mean Temperature Coefficient 0.05)
4.5	Operating Voltage	Meter shall be operational with required accuracy from 0.6 Vref to 1.2 Vref. However meter shall withstand the maximum system Voltage of 440 V (for minimum 5 min)
4.6	Operating Frequency	50 Hz$\pm$ 5%.
4.7	Power Consumption	Voltage circuit: Maximum 5.0 W and 15 VA Current Circuit : Maximum 0.08% Vref*Imax (The additional power requirement during data transmission shall not exceed 7W per communication module).
4.8	Starting Current	20mA (0.2% of Ib) (better than IS requirement preferrable)
4.9	Short time over current	1800 A for 0.01 sec (30Imax for one half cycle at rated frequency)
4.10	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature at 45^0 C.
4.11	Rated Impulse withstand voltage	6KV (shall be applied ten times with one polarity and then repeated with the other polarity.)

4.12	AC withstand voltage for 1 min	4 KV
4.13	Insulation resistance at test voltage 500+/-50 V dc A)Between frame &current ,voltage circuits as well as auxiliary circuits connected Together	5 M ohm.
4.14	Mechanical requirements	Meter shall be in compliance with clause 12.3 of IS 13779
4.15	Resistance to heat and fire	The terminal block and Meter case shall ensure safety against The spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per IS 13779. Fire retardant material shall be used.
4.16	Protection against penetration of dust and water.	Degree of protection :IP 51 or better as per IS 12063/60529, but without suction in the meter. Meter shall comply with clause 6.9 and 12.5 of IS 13779. OEM who provides degree of protection higher than IP51 shall have first preference.
4.17	Resistance against Climatic influence.	Meter shall be in compliance with clause 12.6 of IS 13779.
4.18	Electromagnetic Compatibility (EMC)	Meter shall be in compliance with clause 4.5 and 5.5 of IS 15884
4.19	Accuracy requirements	Meter shall be in compliance with clause 11 of IS 13779.
4.20	Power factor range	Zero lag to Zero lead.
4.21	Energy measurement	Fundamental energy +Energy due to Harmonics
4.22	Connection Diagram	The connection diagram for the system shall be provided on terminal cover.
4.23	Self-Diagnostic feature	The meter shall have indications for un satisfactory/non-functioning of (i) Real Time Clock and calendar (ii) RTC battery (iii) Non Volatile Memory (iv) LCD segment check (v) Communication Card
4.24	Initial startup of meter	Meter shall be fully functional within 5 sec after reference Voltage is applied to the meter terminals.
4.25	Alternate mode of supply to the meters	In case of power failure, reading/data shall be to downloaded with the help of battery of long life(minimum ten years) through Optical port in Battery mode.
4.26	Sleep Mode	Meter shall not go in sleep mode .Display should not be "OFF at any point of time when power up.
4.27	Internal diameter of the terminal holes	8.5mm (minimum) 25 mm

	Depth of the terminal holes	
4.28	Clearance and creepage distance between adjacent terminals	10 mm (minimum) Or better than IS
4.29	Display	Backlit LCD, Scrolling, 10 seconds for each parameter minimum 6 Digits LCD display. The back lit preferably in green color.
4.30	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication
4.31	Software and communication compatibility	The bidder shall supply software required for communication though local (CMRI, BCS and Mobile app software) and remote (AMI) connectivity free of cost and necessary training. For existing meter manufacturer, it should be ensured that all meters (existing non-smart & upcoming smart meters) can be read through one BCS only.
4.32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However parameters like RTC, TOD slots & timings, DIP (billing & load survey), MD reset, billing date change, relay connect/Disconnect, Set load limit, Pre paid/ postpaid, Set metering mode (Import/Export), display setting, shall be reconfigure through BCS/CMRI and remotely over the air (OTA), and any other support will be provided without any additional cost to TATA power till the useful life of the meters. Change in display setting shall be done through firmware upgrade by means of BCS/CMRI/Mobile app and remotely over the air (OTA). Meter data will not get reset while firmware upgrade or any programming. Display sequence for different categories like Net meter, LT2 part and prepaid meter is given in the document.
4.33	Usage Application	Indoor and Outdoor
4.34	Ultrasonic welding	Meter cover and body should be Ultrasonic/chemical welded. Opaque design shall have first preference.
4.35	Meter Dimension in MM	Is not more than 190L*150W*80D
4.36	Real Time clock	Accuracy of RTC Should be as per CBIP-325 report and shall not vary by ± 7 min per year. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. Meter shall support RTC sync request from HES also.

4.37	No display	Meter design in such a way, meter data retrieved if meter found no display.
4.38	KVAH & KVA calculation	Meter shall be programed as Lag+ Lead configuration i.e. Leading PF shall not be considered as unity. The same shall be displayed in BCS.
4.39	Communication module of meter for AMI	As per clause no 1.2 (b) of IS 16444. Meter should have provision of communication module compatible with both the variant mentioned in IS 16444 PART-1. The Communication Network Interface Card (NIC) shall be 4G LTE with fallback provision to 2G or NbIOT and support all the bands offered by TSP's in India. It should be plug-in type and field hot swappable with cellular technology NIC of all type of meters of same make. Support for upgrade to 5G should be there without replacing the meter. Meter should be able to provide required power supply to NIC card. There shall not be an interlock while removing NIC card module with opening meter terminal cover.
4.40	Communication Layer Protocol	Should be as per clause 9.3 of IS 16444 PART-1
4,41	Key Management and Security Feature	Should be as per IS 15959 Part-1 & Part- 2
4.42	Measuring element	Suitable CT/Shunt shall be provided in Phase and Neutral circuit. Details of the same shall be furnish by bidder during tender bid and sample submission.
4.43	Meter Category	D1
4.44	Load switch utilization category	UC1 or better

5 Disconnector/Load Switch, NIC Module

Details & Integration & Communication capabilities and software Feasibilities:

5.1 Disconnector Switch

The meter shall have the facility of disconnecting and re-connecting the load of the meter from the remote and by authenticated command through Laptop/HHU at site by means of a built-in switch/relay.

This operation shall be conducted with the help of a third party software which is owned by TATA POWER and in addition to the manufacturer's own software, in Cellular (GPRS/ 3G / 4G / LTE) which can be given through optical port using external modem by utility.

Each operation of the switches shall be logged by the meter as an event with date and time stamp and reading parameters. This operation should be in line with clause 11 of IS 16444 PART-1, however over current tripping should be disabled by default while supply and should have easy enabling provision in feature. Enabling and Disabling configuration setting

change By Tata Power whenever required remotely over the air (OTA). The Tata Power will decide the enabling of disconnection based on statuary guidelines and changes in future. The cumulative number of ON/OFF operations shall also be made available in meter data and HES.

Logging of load switch profile shall be made available at BCS/HES end along with date/time stamping & instantaneous parameters like voltage, current, energies (Kwh& KVAH).Load switch shall be in "Normally Closed" position.

The make of the load switch should be of reputed make like Grooner (German) or equivalent and same shall be confirmed by the bidder during tendering. Switch shall be in compliance to IS 15884. The brief technical particulars of this Disconnector/load switch are furnished below, bidders to comply for the same:-

S.No.	DESCRIPTION	REQUIREMENT
1	Operating Voltage range	130 V to 470 V
2	Operating Current range	20 mA to 72 A
3	Maximum switching power	22 kVA per phase/ per IS 15884 Annex G
4	No. of poles	2 nos (one in phase and one in neutral)
5	Operation of switches	Simultaneous
6	Utilization Categories	UC1 or better
7	Min. number of operation	3000 (close, open each)

6 Immunity against external influencing signals:

6.1 Magnetic Field:

Meter shall be immune to magnetic field such that it shall not affect the normal overall functionality.

Meter shall comply test of effect due to influence quantities as per latest CBIP amendments.

Meter shall show "Magnet" or appropriate icon under display sequence in the display during magnet event.

The effect on the meter due to magnetic induction of external origin as obtained by the method detailed below shall be determined.

6.1.1 The continuous (DC) "Stray" magnetic induction of 67 m T ± 5% shall be obtained at a distance of 5 mm from the surface of the pole of the electromagnet according to Appendix E of CBIP 325 document, energized with a DC current. The magnetic field shall be applied successively to all the surfaces of the meter. The value of the magneto motive force to be applied shall be generally 1000 ampere-turns. However, considering the non-linearity of magnetization of the core, the ampere-turn might require slight adjustment to achieve the desired output.

6.1.2 The continuous (DC) "abnormal" magnetic induction of 0.2 Tesla ± 5% shall be obtained at a distance of 5 mm from the surface of the pole of the electromagnet according to Appendix E of CBIP 325 document, energized with a DC current. The magnetic field shall be applied successively to all the surfaces of the meter. The value of the magneto motive force to be applied shall be generally 10000 ampere-turn. However, considering the non-linearity of the magnetization of the core, the ampere-turns might require slight adjustment to achieve the desired output.

In the event of logging of presence of abnormal magnetic induction with date & time the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325 document, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and Cos Ø = 1.

6.1.3 The alternating (a.c) "stray" magnetic induction of 0.5 mT ± 5% shall be obtained by placing the meter in the center of circular coil, 1 m in mean diameter, of square section of small radial thickness relative to the diameter, and having 400 ampere-turns.

6.1.4 The alternating (AC) "abnormal" magnetic induction of 10 milli Tesla shall be obtained by placing the meter at various orientations in the centre of a circular coil as specified in 6.1.2, but with 2800 ampere-turns produced by a current of the same frequency as that of the voltage applied to the meter and under the most unfavourable conditions of phase and direction.

In the event of logging of presence of abnormal magnetic induction with date & time the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325 document, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and cos Ø=1.

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

Consumption during magnet tamper shall be recorded in defraud register also. Demand shall be recorded as per actual load only.

6.2 Electrostatic Discharge (ESD)

Meter along with NIC shall be immune up to 35 kV and shall record accurate energy as per IS-13779:2020. Meter shall log the event into memory as 'ESD' with date & time stamp for any ESD greater than 35 kV and shall show 'ESD' in the display and should log in suitable compartment (Abnormal Interference at BCS end).

The shielding around the meter shall be such that it does not get affected by high voltage, high and low energy impulse when comes in contact with meter from any side.

The meter should be immune to high/ low frequency Jammer devices.
Meter shall log event in its memory as jammer with date and time stamp along with snapshot.

6.3 Neutral Disturbance

The meter shall log in the memory as 'NEUTRAL DISTURBANCE' with date and time stamp and show 'ND' /suitable information in the display for Frequency variation below 45 Hz and above 55 Hz with time delay of 1 min and for Pulsating DC and Chopped AC of any value with time delay of 1 min.

The meter shall not saturate on passage of direct current, which can cause the meter either to stop recording/ record inaccurately. DC injection shall be tested both in phase and neutral. Measurement by meter shall not get influenced by injection of DC signal/ DC pulse upto 330V and for any value beyond this, the meter shall log the event into memory as 'NEUTRAL DISTURBANCE' with date & time stamp and shall show 'ND 'in the display after time delay of 1 min(occurrences and restoration time).

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

6.4 Single Wire

Single Wire tamper (Neutral Missing): When neutral is disconnected from both load side and supply side, the meter should record energy as per rated parameters (Vref), UPF. However, meter shall start registering energy

a) At a current of >1 A under tamper condition of neutral missing (where battery is used for voltage reference). Meter will perform the fraud energy registration above 1 A assuming Vref (from battery) and Unity power factor.
b) Condition no. 38 of Annexure I (Timer test) : The timer operation duration shall be 30 seconds.

6.5 Abnormal and Tamper conditions:

The meter shall record forward energy under any abnormal conditions as given in the annexure I.

All the tamper events i.e. shall be logged in the memory of the meter with date and time stamp of occurrence and restoration along with instantaneous electrical parameter (Voltage, Current (phase and neutral), energy, pf)

Meter shall store cumulative count and cumulative durations of all the tamper event which have logged by meter from the date of energization till life of meter.

Tamper count shall be incremented only on the occurrence of the any tamper event with date and time stamp on FIFO basis. The event of which the restoration not occurred those

should not be removed from meter memory and FIFO should not applicable for unrestored event.

The cover open tamper detection should be through heavy duty, sturdy micro switch or equivalent such that it should not operate on vibration or impact during handling or testing.

Meter shall have neutral CT for tamper identification and analysis.
The size of compartments should be such that all above event are accommodated in the assigned event compartment. i.e. if in case of voltage compartment assigned to 4 number of events then the minimum size of this compartment should be such that it should accommodate sum of all maximum number of events as per below table.

All Transactional/Programing related events and Control events for Connect/Disconnect to be logged in BCS/HES along with date/time stamping and instantaneous parameters.
Suitable nomenclature/icon shall be displayed on meter display for Magnet, HV ESD, Neutral Disturbance, Single wire, Meter cover open related events.
There should be provision to provide separate transaction count for Transaction & Firmware upgrades on display, however, at BCS end cumulative programming count (Transaction + Firmware upgrades) should be provided.
Persistence time for occurrence and restoration for the events and compartment block size shall be as per table given.

Compartment size	
Voltage related events	100
Current related events	100
Power failure related events	30
Transaction related events	20
Other events	50
Non-rollover events	1
Control events for Connect/Disconnect	10

Compartment	Event Description	occurrence	Time for occurrence	Restoration	Time for restoration
1	Current reversal	Active current negative	2 Min		2 Min
2	Over current	> 61 Amp	2 Min	=< 60 Amp	2 Min
3	Current mismatch	In-Ip >= 20% Ib and In>Ip	2 Min	In-Ip<20% Ib	2 Min
4	Earth Load	Difference between Phase and Neutral current more than 10%	5 Min	Difference between Phase and Neutral current less than 10%	5 Min
5	Single Wire / Neutral Cut / Netural missing	If neutral is removed and current drawn > 10%Ib in other wire	1 Min	If neutral is restored and meter is in normal condition	1 Min
6	Neutral Disturbance	(1) Vph > 150% Vref OR (2) In case of external signal injection (Chopped DC, Chopped AC and DC injection through diode) OR both above	1 min	If meter is in normal condition	1 Min
7	H.V. Tamper	Vph > 110% of Vref	5 min	Vph < 110% of Vref	5 min
8	Low Voltage	< 216 V	30 min	>= 216 V	5 min
9	ESD/JAMMER Tamper	> 35 KV	immediate	Removal of ESD/Jammer signal	immediate
10	Magnet	Whenever meter sense abnormal magnetic field it shall record Active and Apparent energy at Imax at UPF	immediate	If magnet is removed and meter is in normal condition	immediate
11	Power On/OFF	Actual voltage Off.	60 sec		immediate
12	Cover Open	When cover opens by more than 2 to 4 mm.	Immd	Non Roll over event	
13	Temperature Rise	Occ: T > 70˚C	2		

		REC: T < 60˚C			
14	NIC card Removed (Immediate)	OCC: On removal of card RES: On Insertion card	Immediate		

7 General Technical Requirements

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

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

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

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

S No	Component Function	Requirement	Makes and Origin
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	USA: Anolog Devices, Cyrus Logic, Atmel, Phillips, freescale,NXP South Africa: SAMES Japan: NEC Singapore: Texas
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, Onsemi Japan:Hitachi or Oki Europe: SGS Thomson

3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	Taiwan: Holtek Singapore: Bonafied Technologies Korea: Advantek China:Xiamen/ Tianma
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	USA: National Semiconductors Holland / Korea: Phillips Taiwan: MAXIM Japan:Hitachi, Everlight
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	A class vendor
6.	Electronic components	The active & passive components should be of the surface mount type & are to be handLead & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments, Rohm,Micron Japan:Hitachi, Oki, AVX or Ricoh Korea: Samsung
7.	Battery	Lithium with guaranteed life of 15 years	Varta / Tedirun /Sanyo/ EVE / XENO, Mitsubishi or equivalent.
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips , Dallas, Atmel, Motorola Japan: NEC or Oki
9.	Temperature Sensor	Temperature sensor shall be internal to the meter and its accuracy shall be as per relevant IEC / IS standards. The OEM test report	USA: Philips , Dallas, Atmel, Motorola Japan: NEC or Oki

		to be furnished. With good performance till life of meter.	

Note: The makes of the components are in the preferential order.
Bidder shall submit list of components with makes to TPC during sample meter evaluation and FAT.

8 Meter Body:

Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II) with FVo Fire Retardant, self extinguishing, UV stabilize, recyclable and Anti oxidation properties. The minimum thickness of the meter enclosure shall be 2mm. Meter base shall be opaque with polycarbonate LEXAN 500R or better on prior approval from the Purchaser.

Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the Purchaser. Meter cover & base shall be provided with continuous and seamless Ultrasonic/chemical welding such that it is not opened without breaking the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence. The damage evidence should be visible externally & should be traceable in such a way that attempts can be proved in court of law. The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s). Unidirectional screws to be used on meter covers where ever required.

However meter with opaque encapsulated design/integrated base and cover (single enclosure) would be highly preferred, thus nullifying the possibility of opening of meter case. The Meter body shall be such that the liquid or chemical shall not reach the electronic parts if liquid is injected from any side of meter body such as meter terminals, push button, display, NIC card casing, necessary protection and water tight sealing to be provided at terminals and Push buttons .
Optical port of meter shall be metallic to hold magnetic optical cord during data downloading locally.

9 Terminals, Terminal Block

Terminal block should be in single mould with meter body base(Not separate). After any attempts the terminal block should not be able to disengaged, opened or loosen from any side. Any attempt to disengage the terminal block should certainly damage the meter body with physical evidences. The damage evidences should be visible externally& should be traceable in such a way that attempts can be proved in court of law

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

Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the test given in ISO 75 for temperature of 180°C and pressure of 1.8 M Pa. Tested as per ISO 75-2/A or ASTM D648. The terminal block shall be of opaque with polycarbonate LEXAN500R or equivalent on prior approval from the Purchaser

The terminals shall be marked properly on the terminal block for making external connections.

The terminals and connections shall be suitable to carry up to 120 % of Imax continuously (Imax 60 A).
The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

Temperature sensor shall be available in meter for sensing the temperature and meter should be programmed in such way that on reaching the threshold value set (as per tamper table) the event/alert should go the to HES/MDMS.

The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Terminals shall be preferably of MS cage clamp type as per IS: 15707or of flat end screw with at least 6 mm dia of screw for better contact area.

Internal diameter of the terminal holes shall be minimum 8.5 mm; minimum clearance between adjacent terminals shall be 10 mm. Depth of the terminal holes shall be of 25 mm. Terminal screws shall be of Zinc plated MS bottle type.

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

The preferred arrangement of terminals shall be linear. Minimum two number of terminal screws to be provided per terminal wire

9.1 Terminal Cover:

Terminal cover shall be of short type and shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the Purchaser. Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be as per the Purchaser approval). After sealing the cover, terminals shall not be accessible without breaking the seals. Terminal Cover with C cut to enable smooth insertion of cable in the terminals.

Length of terminal cover shall not be more than 25 mm from bottom of terminal block in line with meter base.

The terminal cover should open on the top side, during connection of the cables. The side opening of terminal cover is not acceptable due to additional opening space requirement.

9.2 Sealing of meter

Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. For this, one no. Polycarbonate seal left side and one no. Hologram seal on right side shall be provided by the Bidder.
Additional Hologram seals will be provided by TPC to supplier for putting them on meter body as per requirement at Factory. Reconciliation of seals shall be provided by bidder after its usage.
All the seals shall be fixed on meter body by the bidder at his works before dispatch.

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

Plug in type NIC card cover should have proper sealing arrangement and should be sealed with manufacturer's polycarbonate seal.

The bidder shall provide the soft record of polycarbonate seal, Manufacturers and TPC hologram seal serial number, NIC card serial number and box packing list used against each meter serial number along with its position in tabular excel form for every lot of meter.

10 TOD Feature:

The meter shall be capable of measuring Cumulative Energy (KWh), Kvah and MD (KW, KVA)with time of day (TOD) registers having 5 zones (no. of zones & time slot shall be programmable by BCS, CMRI, Mobile App, OTA with adequate security level).
TOD Slot Configuration shall be as follows-

Slot	Time Slots
TOD 1	22 to 06 Hrs
TOD 2	06 to 09 Hrs
TOD 3	09 to 12 Hrs
TOD 4	12 to 18 Hrs.
TOD 5	18 to 22 Hrs

11 MD Integration:

The MD integration period shall be 15 minutes. The MD resetting shall be automatic at the 1st of the month i.e. 0000 hours of 1st day of the month. Manual MD reset button functionality shall not be available. Last 12 MD values shall be stored in the memory. MD shall be recorded and displayed with minimum three digits before decimal and minimum two digits after decimal points. MD integration shall be Block Type Demand.

12 Parameters In BCS

All these parameters shall be downloaded locally or remotely. All the parameters shall be recorded in its NVM(Non Volatile Memory). NVM shall have minimum retention time of 10 Years. Below mention current, history billing data and at least 25 tamper event for each tamper shall be available In NVM.
NVM OK/Fail status or flag shall be made available at BCS end for better data analysis.
Preference shall be given to bidder who provides CAIDI profile, Max outage duration, time of max outage & its histories at BCS end.

12.1 Billing Information

Current+ 12 History billing Date
Current + 12 Month History of Energy (KWH, KVAH, KVARH Lag, KVARH Lead, Def KWH, Def KVAH)
Current + 12 Month History Consumption (KWH, KVAH, KVARH Lag, KVARH Lead, Def KWH, Def KVAH)
Current + 12 Month History of Demand (KW,KVA, KVAR Lag, KVAR Lead) Along with date and time stamp
Current + 12 Month History of PF

TOD wise billing Information
Current + 12 Month History of Energy (KWH, KVAH)
Current + 12 Month History of Consumption (KWH, KVAH)
Current + 12 Month History of Demand (KW, KVA) along with date and time stamp
Current + 12 Month History of PF

12.2 Load survey:

The meter shall be capable of recording load profile of atleast 35 days for 15 min IP for ON days only for following parameters.

Voltage
Phase Current
Neutral Current
PF
KWH
KVAH
KW
KVA
Temperature
THD

12.3 MID Night Energy:

Meter shall be capable of recording daily Midnight Energy(KWH, KVAH) 00:00 to 24:00 Hrs for 35 power ON days.

12.4 Instantaneous Parameters:

Meter shall have capable following Instantaneous parameter In Memory and should be available in BCS

Meter Serial No
Meter Type
Meter date and Time
MRI date and time
Dump date and time
Voltage
Phase Current
Neutral current
Power Factor
Instantaneous Frequency
Instantaneous Load (KW, KVA, KVAR Lag, KVAR Lead)
Present Cumulative energy (KWH, KVAH, KVARH Lag, KVARH Lead, Def KWH, Def KVAH)
Cumulative Tamper count
Cumulative Billing Count
Cumulative Programming Count
Terminal Block Temperature
No. of relay switch operation Count
Load limit value in KW
Relay connection status (Connected/Disconnected)
Metering mode

12.5 General Information:-

Meter shall be capable for providing below mention general parameters in memory should be available in BCS

Meter serial No
Meter Type
Manufacture Name
Manufacture date
Meter Class
Meter constant
Meter voltage rating
Meter current rating
Firmware version of meter
Available TOD profile showing timing and seasons
Available Meter display sequence preferrable

12.6 Transactions:-

All the change in software of meter to be logged along with date and time stamp and instantaneous parameters.

12.7 Load switch profile:-

All energy & demand parameters alongwith date time stamping shall be available with status of Relay connect/disconnect.

13 Display units:

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

The KWh register shall have minimum 6 digits and size of the digits shall be minimum 10mmx6mm. Cumulative energy (KWh) shall be displayed without decimal in auto scroll mode. (However decimal shall be available in push button mode for high resolution display for testing)

Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (I.e. if MD1 is displayed in Auto scroll mode, Header (MD1) and value (say 5.23 KW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 30 sec, if push button is not operated.

1. **<u>Default</u> Display sequence –**

Display1 Parameters (Auto Scroll Mode)

Cumulative Forward kWh (6+0)

Display2 Parameters (Manual Scroll Mode)

Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Voltage
Instantaneous Phase Current
Instantaneous Neutral Current
Instantaneous P.F
Instantaneous Active power (3+3)

Instantaneous Apparent power (3+3)
Instantaneous Reactive power (3+3) (Lag or Lead)
Cumulative Forward kWh (6+0)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag (6+0)
Tariff wise MD Forward KVA Date & time
Cumulative Forward kVArh lead (6+0)
Cumulative Forward kVAh (6+0)
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
Latest reset Cumulative Forward kWh (6+0)
Latest reset TOD 1 Forward kWh
Latest reset TOD 2 Forward kWh
Latest reset TOD 3 Forward kWh
Latest reset TOD 4 Forward kWh
Latest reset TOD 5 Forward kWh
Latest reset Cumulative Forward kVArh lag (6+0)
Latest reset Tariff wise MD Forward KVA Date & time
Latest reset Cumulative Forward kVArh lead (6+0)
Latest reset Cumulative Forward kVAh (6+0)
Latest reset TOD 1 Forward kVAh
Latest reset TOD 2 Forward kVAh
Latest reset TOD 3 Forward kVAh
Latest reset TOD 4 Forward kVAh
Latest reset TOD 5 Forward kVAh
Rising Demand Forward kW along with time elapsed.
Cumulative Tamper Count
History of last 3 tampers occurrence & recovery
Defraud Register Cumulative kWh during Magnetic Tamper (6+0)
Defraud Register Cumulative kWh during ND Tamper (6+0)
Defraud Register Cumulative kWh during NM Tamper (6+0)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest Neutral Disturbance occurrence date & time
Latest Neutral Disturbance recovery date & time
Latest Neutral Missing occurrence date & time
Latest Neutral Missing recovery date & time

Cover Open tamper occurrence Date (If Occurred Only)
Cover Open tamper occurrence Time (If Occurred Only)
Status of Load Switch
Count of Relay connect
Relay connect Date of last occurrence
Relay connect Time of last occurrence
Count of Relay disconnect
Relay disconnect Date of last occurrence
Relay disconnect Time of last occurrence
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display 3 Parameters (High Resolution Mode)
Cumulative Forward kWh (2+4)
Cumulative Forward kVArh lag (2+4)
Cumulative Forward kVArh lead (2+4)
Cumulative Forward kVAh (2+4)

Battery mode will be as per display 1, 2 and 3 sequentially.

Meter shall be unidirectional by default unless specified. However it can be programmed through BCS, HHU, Mobile App and OTA.

2. **Display sequence for LT 2 part billing (programmable through firmware upgrade) –**

Display1 Parameters (Auto Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Cumulative Forward kWh (6+0)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead

Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Voltage
Instantaneous Phase Current
Instantaneous Neutral Current
Instantaneous P.F
Instantaneous Active power (3+3)
Instantaneous Apparent power (3+3)
Instantaneous Reactive power (3+3) (Lag or Lead)
Cumulative Forward kWh (6+0)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward KVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh
Latest reset-TOD 2 Forward kWh
Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time

Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Frozen energy in Forward kWh for last 6 reset
Frozen Maximum demand in Forward kVA for last 6 reset
Rising Demand Forward kW along with time elapsed.
Cumulative Tamper Count
History of last 3 tampers occurrence & recovery
Defraud Register Cumulative kWh during Magnetic Tamper (6+0)
Defraud Register Cumulative kWh during ND Tamper (6+0)
Defraud Register Cumulative kWh during NM Tamper (6+0)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest Neutral Disturbance occurrence date & time
Latest Neutral Disturbance recovery date & time
Latest Neutral Missing occurrence date & time
Latest Neutral Missing recovery date & time
Cover Open tamper occurrence Date (If Occurred Only)
Cover Open tamper occurrence Time (If Occurred Only)
Status of Load Switch
Count of Relay connect
Relay connect Date of last occurrence
Relay connect Time of last occurrence
Count of Relay disconnect
Relay disconnect Date of last occurrence
Relay disconnect Time of last occurrence
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display 3 Parameters (High Resolution Mode)
Cumulative Forward kWh (2+4)
Cumulative Forward kVArh lag (2+4)
Cumulative Forward kVArh lead (2+4)

Cumulative Forward kVAh (2+4)
Battery mode will be as per display 1,2 and 3 sequentially.

3. Display sequence for Net meter (programmable) –

Display1 Parameters (Auto Scroll Mode)

Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Cumulative kWh (6+0) - Import
TOD 1 kWh - Import
TOD 2 kWh - Import
TOD 3 kWh - Import
TOD 4 kWh - Import
TOD 5 kWh - Import
Cumulative kVArh lag - Import
Tariff wise MD kVA Date & time - Import
Cumulative kVArh lead - Import
Cumulative kVAh - Import
TOD 1 kVAh - Import
TOD 2 kVAh - Import
TOD 3 kVAh - Import
TOD 4 kVAh - Import
TOD 5 kVAh - Import
Cumulative kWh (6+0) - Export
TOD 1 kWh - Export
TOD 2 kWh - Export
TOD 3 kWh - Export
TOD 4 kWh - Export
TOD 5 kWh - Export
Cumulative kVArh lag - Export
Tariff wise MD kVA Date & time - Export
Cumulative kVArh lead - Export
Cumulative kVAh - Export
TOD 1 kVAh - Export
TOD 2 kVAh - Export
TOD 3 kVAh - Export
TOD 4 kVAh - Export
TOD 5 kVAh - Export

Display2 Parameters (Manual Scroll Mode)

Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Voltage
Instantaneous Phase Current
Instantaneous Neutral Current
Instantaneous P.F
Instantaneous Active power (3+3)
Instantaneous Apparent power (3+3)
Instantaneous Reactive power (3+3) (Lag or Lead)
Cumulative kWh (6+0) - Import
TOD 1 kWh - Import
TOD 2 kWh - Import
TOD 3 kWh - Import
TOD 4 kWh - Import
TOD 5 kWh - Import
Cumulative kVArh lag - Import
Tariff wise MD kVA Date & time - Import
Cumulative kVArh lead - Import
Cumulative kVAh - Import
TOD 1 kVAh - Import
TOD 2 kVAh - Import
TOD 3 kVAh - Import
TOD 4 kVAh - Import
TOD 5 kVAh - Import
Cumulative kWh (6+0) - Export
TOD 1 kWh - Export
TOD 2 kWh - Export
TOD 3 kWh - Export
TOD 4 kWh - Export
TOD 5 kWh - Export
Cumulative kVArh lag - Export
Tariff wise MD kVA Date & time - Export
Cumulative kVArh lead - Export
Cumulative kVAh - Export
TOD 1 kVAh - Export
TOD 2 kVAh - Export
TOD 3 kVAh - Export
TOD 4 kVAh - Export
TOD 5 kVAh - Export
Latest reset- Cumulative kWh (6+0) - Import
Latest reset- TOD 1 kWh - Import

Latest reset- TOD 2 kWh - Import
Latest reset- TOD 3 kWh - Import
Latest reset- TOD 4 kWh - Import
Latest reset- TOD 5 kWh - Import
Latest reset- Cumulative kVArh lag - Import
Latest reset- Tariff wise MD kVA Date & time - Import
Latest reset- Cumulative kVArh lead - Import
Latest reset- Cumulative kVAh - Import
Latest reset- TOD 1 kVAh - Import
Latest reset- TOD 2 kVAh - Import
Latest reset- TOD 3 kVAh - Import
Latest reset- TOD 4 kVAh - Import
Latest reset- TOD 5 kVAh - Import
Latest reset- Cumulative kWh (6+0) - Export
Latest reset- TOD 1 kWh - Export
Latest reset- TOD 2 kWh - Export
Latest reset- TOD 3 kWh - Export
Latest reset- TOD 4 kWh - Export
Latest reset- TOD 5 kWh - Export
Latest reset- Cumulative kVArh lag - Export
Latest reset- Tariff wise MD kVA Date & time - Export
Latest reset- Cumulative kVArh lead - Export
Latest reset- Cumulative kVAh - Export
Latest reset- TOD 1 kVAh - Export
Latest reset- TOD 2 kVAh - Export
Latest reset- TOD 3 kVAh - Export
Latest reset- TOD 4 kVAh - Export
Latest reset- TOD 5 kVAh - Export
Frozen energy in kWh for last 6 reset- Import
Frozen Maximum demand in kVA for last 6 reset- Import
Frozen energy in kWh for last 6 reset- Export
Frozen Maximum demand in kVA for last 6 reset- Export
Rising Demand Forward kW along with time elapsed.
Cumulative Tamper Count
History of last 3 tampers occurrence & recovery
Defraud Register Cumulative kWh during Magnetic Tamper (6+0)
Defraud Register Cumulative kWh during ND Tamper (6+0)
Defraud Register Cumulative kWh during NM Tamper (6+0)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest Neutral Disturbance occurrence date & time
Latest Neutral Disturbance recovery date & time
Latest Neutral Missing occurrence date & time

Latest Neutral Missing recovery date & time
Cover Open tamper occurrence Date (If Occurred Only)
Cover Open tamper occurrence Time (If Occurred Only)
Status of Load Switch
Count of Relay connect
Relay connect Date of last occurrence
Relay connect Time of last occurrence
Count of Relay disconnect
Relay disconnect Date of last occurrence
Relay disconnect Time of last occurrence
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display 3 Parameters (High Resolution Mode)
Cumulative Forward kWh (2+4) - Import
Cumulative Forward kVArh lag (2+4) - Import
Cumulative Forward kVArh lead (2+4) - Import
Cumulative Forward kVAh (2+4) - Import
Cumulative Forward kWh (2+4) - Export
Cumulative Forward kVArh lag (2+4) - Export
Cumulative Forward kVArh lead (2+4) - Export
Cumulative Forward kVAh (2+4) – Export
Battery mode will be as per display 1,2 and 3 sequentially.

For Net meter mode, Both Import and export energy recording shall be applicable in this mode of metering and relevant parameters like Billing, LS, tamper logics etc shall be updated and shall be available in BCS also.

Note: Latest reset or Frozen is History 1

4. Display sequence for Pre Paid meter (programmable) –

Display1 Parameters (Auto Scroll Mode)

Cumulative Forward kWh (6+0)
Last token recharge amount
Last token recharge time and date
Total amount at last recharge
Current balance amount
Current balance Time and date

Display2 Parameters (Manual Scroll Mode)

Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Voltage
Instantaneous Phase Current
Instantaneous Neutral Current
Instantaneous P.F
Instantaneous Active power (3+3)
Instantaneous Apparent power (3+3)
Instantaneous Reactive power (3+3) (Lag or Lead)
Last token recharge amount
Last token recharge time and date
Total amount at last recharge
Current balance amount
Current balance Time and date
Cumulative Forward kWh (6+0)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag (6+0)
Tariff wise MD Forward KVA Date & time
Cumulative Forward kVArh lead (6+0)
Cumulative Forward kVAh (6+0)
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
Latest reset Cumulative Forward kWh (6+0)
Latest reset TOD 1 Forward kWh
Latest reset TOD 2 Forward kWh
Latest reset TOD 3 Forward kWh
Latest reset TOD 4 Forward kWh
Latest reset TOD 5 Forward kWh
Latest reset Cumulative Forward kVArh lag (6+0)
Latest reset Tariff wise MD Forward KVA Date & time
Latest reset Cumulative Forward kVArh lead (6+0)
Latest reset Cumulative Forward kVAh (6+0)
Latest reset TOD 1 Forward kVAh
Latest reset TOD 2 Forward kVAh
Latest reset TOD 3 Forward kVAh
Latest reset TOD 4 Forward kVAh
Latest reset TOD 5 Forward kVAh
Rising Demand Forward kW along with time elapsed.
Cumulative Tamper Count

History of last 3 tampers occurrence & recovery
Defraud Register Cumulative kWh during Magnetic Tamper (6+0)
Defraud Register Cumulative kWh during ND Tamper (6+0)
Defraud Register Cumulative kWh during NM Tamper (6+0)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest Neutral Disturbance occurrence date & time
Latest Neutral Disturbance recovery date & time
Latest Neutral Missing occurrence date & time
Latest Neutral Missing recovery date & time
Cover Open tamper occurrence Date (If Occurred Only)
Cover Open tamper occurrence Time (If Occurred Only)
Status of Load Switch
Count of Relay connect
Relay connect Date of last occurrence
Relay connect Time of last occurrence
Count of Relay disconnect
Relay disconnect Date of last occurrence
Relay disconnect Time of last occurrence
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display 3 Parameters (High Resolution Mode)

Cumulative Forward kWh (2+4)
Cumulative Forward kVArh lag (2+4)
Cumulative Forward kVArh lead (2+4)
Cumulative Forward kVAh (2+4)
Battery mode will be as per display 1,2 and 3 sequentially.

All these parameters shall be downloaded locally or remotely and interpreted in PC/Laptop.

All the parameters shall be recorded and memorized in its Non Volatile Memory (NVM).The corresponding non-volatile memory shall have a minimum retention time of 10 years.

Error code – Meter and NIC health indicator shall be displayed as following-

SR No.	Error Code to be Displayed	Description
1	Err 00	All Good
2	Err 01	Meter NIC Communication failure
3	Err 02	Modem Initialization Failure
4	Err 03	SIM Not Detected
5	Err 04	SIM Invalid
6	Err 05	No GSM Network Coverage
7	Err 06	GPRS Network Registration failure
8	Err 07	GPRS Registration Denied
9	Err 08	No APN Configured
10	Err 09	GPRS Connection Not Established
11	Err 10	HES IP/Port not configured
12	Err 11	HES Port Not Open
13	Err 12	Any key Mismatch Between Meter and NIC

14 Output Device:

14.1 Pulse rate

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

14.2 Communication LCD indicator

The meter shall be provided with suitable LCD/LED indication for communication in progress.

Meter shall display Communication status indications on LCD/LED without affecting normal display parameters.

14.3 Load Switch LED indicator

The meter shall be provided with suitable LED/LCD indication for condition of load switch (Close/open). LCD should show/work when load switch is open.

15 Name plate and Marking:

Meters shall have a name plate clearly visible and effectively secured against removal. The name plate data should be laser printed. No sticker to be used to avoid loss of data in event of fire. The base color of Name plate shall be white indelibly and distinctly marked with all essential particulars as per relevant standards along with the following. The Serial no. series applicable for the meters shall be provided by Tata Power.

i. Manufacturer's name
ii. Type designation
iii. Number of phases and wires
iv. Serial number (Meter serial number shall be laser printed on name plate instead on sticker).
v. Serial number along with barcode
vi. Month and Year of manufacture
vii. Unit of measurement
viii. Reference voltage ,frequency
ix. Ref. temperature
x. Rated basic and maximum Current
xi. Meter constant (imp/kWh)
xii. 'BIS' Mark
xiii. Class index of meter
xiv. "Property of Tata Power Co. Ltd
xv. Purchase Order No. & date
xvi. Guarantee period.
xvii. Sign of double square
xviii. Country of manufacture.
xix. Firmware version of meter
xx. Meter category
xxi. Symbol of load switch.
xxii. NIC serial NO (Shall be visible from Communication Module Slot)
xxiii. Compatibility of NIC Card.

Bidder should ensure that NIC provided in meters are having Sr. No., MFG date, Property of TATA POWER' marked, PO date and no. (same as that of meter PO)

16 Tests:

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

16.1 Routine Test

i. AC High Voltage test
ii. Insulation test
iii. Test on limits of error
iv. Test of starting current
v. Test of no load condition

16.2 Acceptance test:

i. AC High Voltage test
ii. Insulation test
iii. Test on limits of error as per IS load points for both Phase and neutral channel
iv. Test of meter constant
v. Test of starting current
vi. Test of no load condition
vii. Test of repeatability of error.
viii. Test of power consumption.
ix. Test for Immunity against external influencing signal as per the Purchaser specification
x. Test for Immunity against DC Immunity as per the Purchaser specification
xi. Test for Immunity against Tamper conditions as per the Purchaser specification
xii. Error measurements with 38 abnormal condition as per annexure I
xiii. Test to Influence of Harmonics
xiv. Supply voltage and frequency variation test
xv. Testing of self diagnostic features
xvi. Tamper count increment and logging with date and time in meter database.
xvii. All tests as defined in IS15959(Part-2): 2016
xviii. Functionality of communication module is 16444 part2
xix. smart meter communicability as per provision of 28 IS 15959 (part-3)
xx. Physical check of NIC and replaceable ease of the NIC module in meter

16.3 Type test:

i. All tests as defined in IS16444 Part 1/IS 15959 Part 2/ IS 13779:2020 with latest edition.
ii. Test against abnormal magnetic influence as per CBIP TR 325 with latest edition.
iii. DC immunity test (injection both on phase and neutral terminal) with latest edition
iv. Test for Material used for Terminal Block and meter body as per relevant standards with latest edition
v. IP test

Note:- Bidder must mention IS 13779:2020 with latest edition in factory test report.

16.4 Special test:

i. The bidder shall demonstrate the communication capability of the meter through communication modes as defined in the specification before conducting acceptance tests. The bidder shall ensure that API (Application protocol interface) is compatible with TPC.
ii. Temperature rise of terminal block with 120% Imax for 6 hours on actual load on sample from first lot. Accuracy and temperature shall be analyzed before and after conducting test.

17 Type Tests Certificates:

The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA or any NABL accredited lab as per the relevant standards. Type test should have been conducted in certified Test Laboratories during the period not exceeding 5 years from the

date of opening the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPC.

18 Pre-Dispatch Inspection:

The successful bidder shall submit two prototype samples for further testing and compliance as per specifications and getting approval before mass manufacturing. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Bidder shall grant free access to the places of manufacture to TPC's representatives at all times when the work is in progress. Inspection by the TPC or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific DC (Dispatch Clearance) is issued by TPC.

Following documents shall be sent along with material-

a) Test reports
b) DC issued by TPC
c) Invoice in duplicate
d) Packing list along with seal and NIC details
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)
i) Compatible BCS software
j) Meter user manual covering Technical Parameters, display, tamper logics, meter dimensions, etc
k) GTP (Guaranteed Technical Particulars)

19 Inspection after Receipt At Store:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection. The successful bidder shall submit two extra carton boxes (unpaid) per lot delivered (lot size shall be 2,000 numbers or as defined in the order)

20 Guarantee:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the purchaser up to a period of at least **60** months from the date of last supplies, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame not more than 1 month, and to the entire satisfaction of Tata Power, failing which Tata Power will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

Bidder shall own responsibility for all internal component with an end to end agreement with individual component manufacturer.

Bidder to collect all defective meters from stores for repairs as per defined timeframe and send those meters immediately after repairs.
Bidders to submit CAPA report of each defective meter and submit the same to Lab/Store representative along with dispatch of repaired meters.
Format of CAPA report-

S. No	Type	Meter No	Defects from Tata Power	Observations at OEM	Root-Cause by OEM	Corrective Actions taken by OEM	Preventive Actions taken by OEM

Meters to be designed in such a way that cases of No display/ Display faulty will be bare minimum or else Tata Power will liable to reject entire lot of meters.

Bidder shall further be responsible for 'free replacement/repairs" of entire lot of meters for any 'Latent Defects '(design issue due to faulty lot component) if noticed and reported by the purchaser within guarantee period.

Manufacture shall collect disputed meter from meter stores and provide testing report of disputed meter refer by TPC within 15 days period irrespective of guarantee period.

21 Packing

Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The material used for packing shall be environmentally friendly.
Packing and transportation shall be as per IS 15707:206 clauses 9.1 and 9.2.
Routine test report of the individual meter shall be kept inside each card board carton of the meter.
The softcopy in PDF format, of the routine test certificate of each meter to be provided by bidder with each lot,

22 Tender Sample

Bidders are required to manufacture 3 sample meters as per the TPC specification (sealed, unsealed and openable base and cover to view/test the inner circuits) and submit the sample (non-returnable) along with bid for approval.

Following accessories to be submitted along with sample

1. Test Reports of 3 sample meters (Type test, Acceptance test, Routine Test Report**)**
2. Detailed User Manual along with dimension
3. Guaranteed Technical Particulars
4. Tamper logic sheet
5. Display parameter sequence
6. BCS,MRI and Mobile app software for local reading, programming and connect/disconnect testing
7. Optical communication cords
8. Internal connection diagram
9. List and make of all electronics component used
10. Clause by clause compliance sheet of Technical Specification
11. Bidder shall be responsible for integration of Meters with NIC and TPC HES.

23 Quality Control

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished.

Quality should be ensured at the following stages:

- At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.
- At insertion stage, all components should undergo computerized testing for conforming to design parameter and orientation.
- Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipment (ATEs).
- Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will beare kept in ovens for 24 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 24 hours meter should work satisfactorily)

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

24 Minimum Testing Facilities

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

25 Manufacturing activities

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

26 Drawings

Following drawings & Documents shall be prepared based on TPC specifications and statutory requirements and shall be submitted with the bid:

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

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

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

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

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

27 Guaranteed Technical Particulars:

S.No	**Description**	**Units**	**As Furnished by Bidder**

1	Type of meter		
2	Accuracy Class of the meter		
3	Ib & Imax	A	
4	Operating Voltage of Meter and communication unit	V	
5	Operating Frequency	*Hz*	
6	Power Consumption and Burden		
7	Starting Current	mA	
8	Short time over current	A	
9	Influence of heating		
10	Rated impulse withstand voltage	KV	
11	AC withstand Voltage for 1 min	KV	
12	Insulation resistance Between frame &Current, voltage circuits connected together:	M ohm	
13	Mechanical requirement as per IS 13779		
14	Resistance to heat and fire (As per specification)		
15	Degree of protection		
16	Resistance against climatic influence (as per IS 13779)		
17	Electromagnetic Compatibility (EMC)		
18	Accuracy requirements (As per IS 13779		
19	Power factor range		
20	Energy measurement		
21	Connection Diagram for system on terminal cover	Yes/No	
22	Self diagnostic feature		
23	Initial start up of meter (meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals)		

24	Terminal block a) Depth of the Terminal holes b) Internal diameter of terminal holes c) Clearance between adjacent terminals	 Mm Mm Mm	
25	Communication capabilities as per clause 5.0		
26	Immunity against abnormal Magnetic influence,		
27	Immunity against HV ESD		
28	DC Immunity as defined in		
29	Grade of material for a) Meter base b) Meter cover c) Terminal block d) Terminal cover		
30	Tamper counters		
31	Recording forward energy in all conditions as per annexure I (including current/potential reversal)	Yes/No	
32	Makes of all components used in the meter.	Yes/No	
33	Non Volatile memory (Retention period)		
34	Measuring elements used in the meter		
35	Power supply to circuit in case of supply failure		
36	Display of measured values (As per specification – clause 13)	Energy, Demand, Voltage, current, PF	

37	LCD display (Type and viewing angle)		
38	Pulse rate	Imp/kWh, Imp/kVArh	
39	Name plate marking with laser Printer	Yes/No	
40	Routine test certificates	Yes/No	
41	Acceptance test certificates	Yes/No	
42	Type test certificates	Yes/No	
43	Guarantee certificates	Yes/No	
44	Display Sequence	Yes/No	
45	Tamper thresholds	Yes/No	
46	Ultrasonic Welding of cover and Base	Yes/No	
47	Fire retardant category of meter Body And terminal block		
48	Providing zig for NVM data Retrieval		
49	Meter shall be programed for like RTC, TOD		
50	Dimension of meters L*B*H		
51	KVAH & KVA calculation		
52	Meter data retrieved if meter found no display	Yes/No	
53	RJ 11 Pin configuration as per TPC	Yes/No	
54	Make of Disconnector Switch		

55	Temperature Sensor near terminal block at incomer side		
56	Output Device (LEDs) As per Cl 14		
57	NIC module with cover & sealing arrangement		
58	Measuring element used		
59	Meter Category		
60	Load switch utilization category		
61	Calibration (programming)		
62	Usage application	Indoor/ Outdoor	
63	Ultrasonic welding/ / Chemical welding		

Electronics parts

Sr NO	**Component Function**	**Requirement**	**Makes and Origin (to be provide by Bidder)**
1.	Measurement/ computing chips	The Measurement/ computing chips u in the meter should be with the Surfa mount type along with the ASICs	
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	
3.	Display modules	The display modules should be well protected from the external UV radiat . The display visibility should be suffic to read the meter mounted between height of 0.5m and 2m. The construc of the modules should be such that the displayed quantity should no disturbed with the life of display. (Pir Type) It should be trans-reflective STN type industrial grade with extended	

		temperature range.	
4.	Optical port	Optical port should be used to transfe meter data to meter reading instrume The mechanical construction of the p should be such to facilitate the data transfer easily.	
5	P.C.B.	Glass Epoxy, fire resistance grade FR4 with minimum thickness 1.6 mm and Conformal coating required to protec Environment like moisture	
6.	Electronic components	The active & passive components sho be of the surface mount type & are to handled & soldered by the state of ar assembly processes.	
7.	Battery	Lithium with guaranteed life of 15 yea	
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	
9.	Temperature sensor	Temperature sensor shall be internal the meter and its accuracy shall be as relevant IEC / IS standards. The OEM t report to be furnished. With good performance till life of meter.	

28 Schedules Of Deviations:

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications.

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

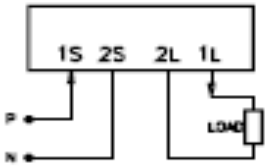
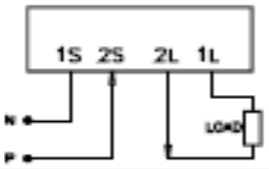
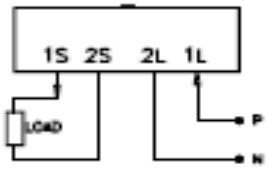
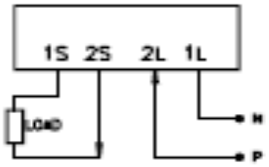
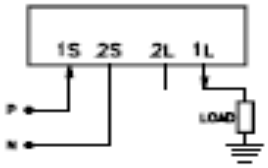
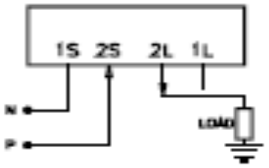
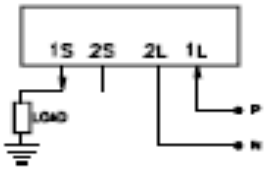
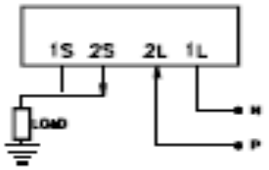
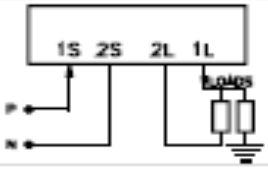
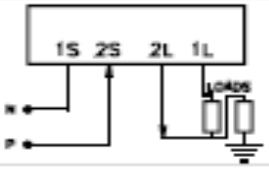
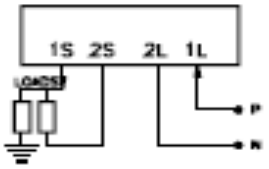
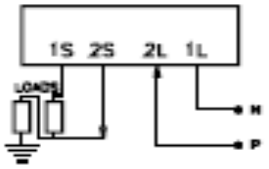
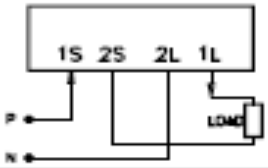
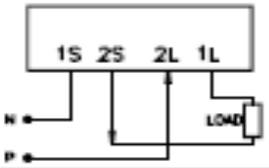
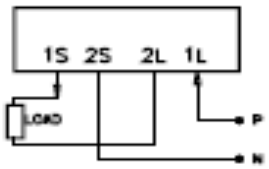
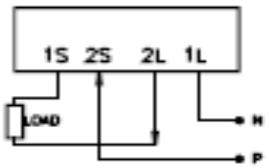
S.No.	Clause No.	Details of deviation with justifications

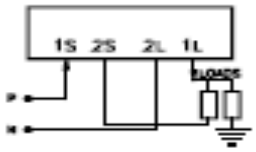
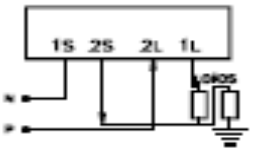
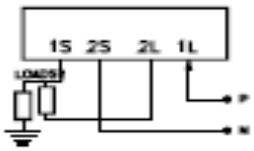
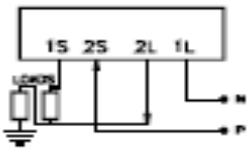
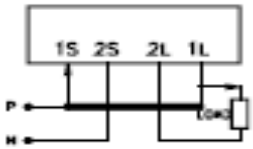
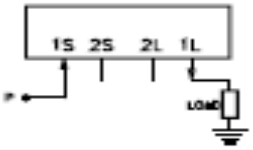
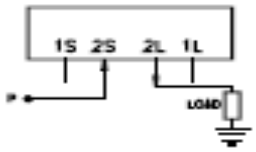
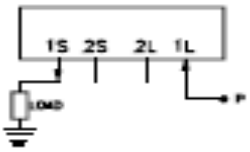
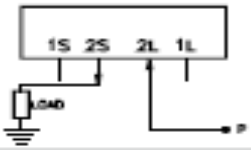
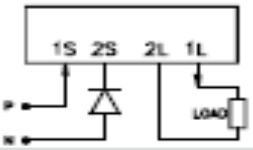
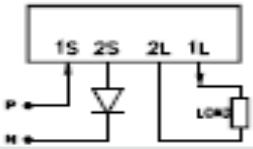
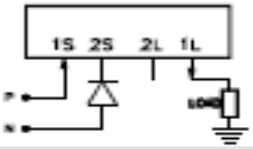
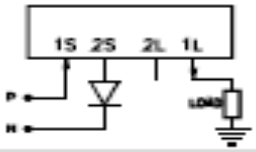
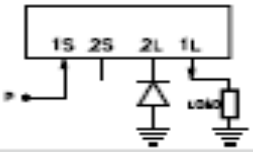
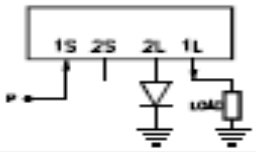
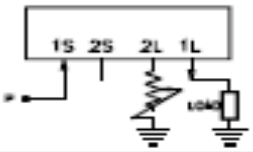
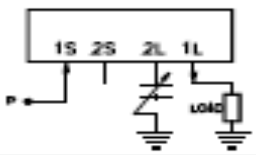
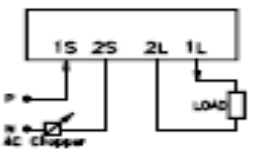
We confirm that there are no deviations apart from those detailed above.

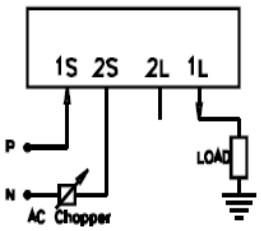
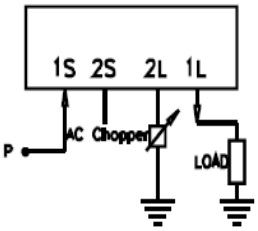
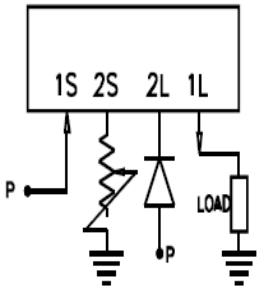
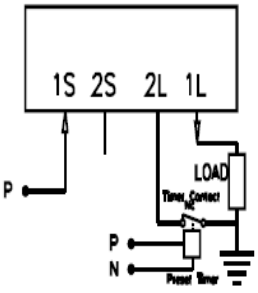
Seal of the Company.

Designation Signature

Annexure :-1

No	Name of Condition	Graphical View	No	Name of Condition	Graphical View
1	Normal condition		2	Phase neutral interchanged at supply side4	
3	Supply-Load interchanged		4	Phase & Neutral interchanged in condition (3)	
5	Full Load Earthed		6	phase-neutral interchanged at supply side in condition (5)	
7	supply load interchanged in condition(5)		8	phase and neural wire interchanged in condition (7)	
9	Partial load earthed		10	phase & Neutral wire interchanged in condition (9)	
11	supply-load interchanging in condition (9)		12	Phase & Neutral wire interchanged in condition (11)	
13	Neutral current reversed		14	Phase & Neutral interchanged in condition 13	
15	supply load interchanging in condition 13		16	Phase-Neutral interchanged in condition 15	

No	Name of Condition	Graphical View	No	Name of Condition	Graphical View
17	Partial load earthed in condition 13		18	Phase-Neutral interchanged in condition 17	
19	Supply-load interchanging in condition 17		20	Phase-Neutral Interchanged in condition 19	
21	Current bypass		22	Neutral Missing	
23	Neutral Missing Phase-at 2S		24	Supply -load interchanged in condition 22	
25	Phase at 2L in condition 24		26	Diode (Reversed) in Neutral	
27	Diode(forward) in Neutral		28	Full load earthed in condition 26	
29	Full load earthed in condition 27		30	Neutral Missing , diode (reversed) at 2L & earthed full load earthed	
31	Diode forward in condition 30		32	Neutral Missing, variable load at 2L & earthed, full load earthed	
33	Neutral Missing, variable capacitance at 2L & earthed, full load earthed		34	chopper in neutral	

No	Name of Condition	Graphical View	No	Name of Condition	Graphical View
35	Load earthed in condition 34		36	Neutral Missing, AC Chopper & earthed, full load earthed	
37	Neutral Missing, earthed load,diode in output and variable resistance with earthing at the input		38	Neutral Missing full load earthed at regular time interval	

TECHNICAL SPECIFICATION

FOR

Three Phase, Four Wire

Class 1, 10-100 Amp,

Smart Whole Current Meter

Tata Power Company Ltd.

Meter management Department

Dharavi Receiving Station,

Matunga,

Mumbai – 400 019

Document No.	TPC\MTL\WC\2019\02	Issue No.	01
		Issue Date	25.09.2019
Revision No.	03	Revision Date	28.02.2024
Description	Prepared By & Date	Reviewed By & Date	Approved By & Date
SPECIFICATION FOR SINGLE PHASE SMART DLMS METER	Himali Patel	Rahul Ranadive & Devanjan Dey	S V Savarkar

Revision Summary

Revision No.	Revision Details	Revision Date	Reviewed & Approved By
01	Clause No. 4.31, 4.32, 13.5, 13.8 is modified to include common BCS compatibility, various program feature, load limit profile.	15.10.2020	N Manjunath J S Wadhwa
02	Modified/ Added current rating, DIP(Demand Integration Period) and SIP(Survey Integration Period), Latest IS no., Current rating, Power consumption limit, Change of display sequence through firmware, Additional display sequence for Net meter and LT 2 part, self-diagnostics list for LCD segment check, RTC limit, RTC sync, KVAH logic availability in BCS, NIC with 4G LTE with fallback to 2G, Logging of load switch, NIC module design and integration removed from meter specs, Magnetic tamper, ESD tamper, ND tamper, Nomenclature for events, compartment size, smart PT feature optical port with metallic, encapsulated design of meter body, TPC hologram seal to vendor, Meter category in nameplate, pre dispatch inspection, meter guarantee as 7 years, CAPA of defective meter, latent defect.	10.06.2022	Devanjan Dey S V Savarkar
03	Updated Communication module with NBIOT added, metallic optical port added, display sequence modified, meter guarantee modified as 120 months and loading factor is added for meter guarantee, defective meter CAPA format is added, GPS tracking system, NIC card module position, Min and max instantaneous value in LS added.	18.07.2023	Rahul Ranadive & S V Savarkar
04	Modified Meter guarantee as 60 months from 120 months, Load survey days as 35 days, Midnight energies as 35 days. Requirement of GPS tracking is removed.	28.02.2023	Rahul Ranadive/Devanjan Dey & S V Savarkar

Contents

1 Scope:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at store/site of Three phase four Wire, 3*240 V, 10-100A current operated ac static meters of accuracy class 1.0 (here after referred as meters) complete with all accessories for efficient and trouble free operation. The Meter shall use 4G LTE with fallback provision to 2G for a two way communication with the Head End System (HES)

2 Applicable Standards:

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

a) IS 16444 Part-1 2015) : A.C. Static Direct connected Watt hour Smart meter class 1.0 and 2.0
b) IS 13779 (2020) :A.C. Static Watt hour meter class 1.0 and 2.0
c) IS 15884 (2010) : A.C. direct connected static prepayment meters for active energy (CL 1 & 2)
d) IS 15959(Part 1-2011) : Data exchange for electricity meter reading, tariff and load control
e) IS 15959(Part 2-2011) : Data exchange for electricity meter reading , tariff and load control
f) IEEE 802.15.4(2003) : Standard for local and metropolitan area networks
g) IS 9000 : Basic Environmental testing procedure for electrical and electronic items.
h) IS 12346 (1999) : Specification for testing equipment for A.C.Electrical energy meter.
i) IS11000 (1984) : Fire hazard testing
j) IEC 62052-11 *(2003)* :Electricity Requirements (AC) General Requirements Tests and Test conditions for A.C.Static Watt hour meter for active energy Class 1.0 and 2.0.
k) IEC 62053-21 (2003) : A.C.Static Watt hour meter for active energy Class 1.0 and 2.0
a. IS 15707 (2006) : Testing Evaluation installation and maintenance of AC Electricity Meters- Code of practice.
l) IEC 60068 : Environmental testing.
m) CBIP – TR No.325 : Specification for A.C. Static Electrical Energy Meters (latest amendment).
n) CEA Regulation (2006) : Installation and operation of meters Dtd: 17/03/2006.
o) IS 60529 : Degree of protection provided by enclosure

3 Climatic Conditions of The Installation:

a) Max. Ambient Temperature : 50 deg.C
b) Max. Daily average ambient temp. : 40 deg.C
c) Min Ambient Temp : 0 deg C
d) Maximum Humidity : 95%
e) Minimum Humidity : 10%
f) Average No. of thunderstorm days per annum : 50
g) Maximum Annual Rainfall : 1450 mm
h) Average No. of rainy days per annum : 60
i) Rainy months : June to Oct.
j) Altitude above MSL not exceeding : 300 meters
k) Wind Pressure : 150 kg/sq m

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.3 g.

4 Technical Requirements:

S.No.	DESCRIPTION	REQUIREMENT
4.1	Type of the meter	Three phase Four wire , whole current meter-direct reading type without application of any multiplication constant. It also Consists of measuring elements, TOU of register, Display load switch and plug in type bi-directional communication module all integral within the meter. The meter design shall be such that no MF required for any parameter
4.2	Accuracy Class of the meter	1.0
4.3	Basic Current (Ib) & rated Maximum current (Imax)	Ib= 10A; Imax= 100 Amps
4.4	Reference Conditions for testing the performance of the meter	Vref = 3 X 240 V ± 1 % Frequency = 50hz ± 0.3% Temperature= 27 C± 2 0C (if the tests are made at the temperature other than reference temperature the results shall be corrected by applying Mean Temperature Coefficient 0.05)
4.5	Operating Voltage	Meter shall be operational with required accuracy from 0.6 Vref to 1.2 Vref. However meter shall withstand the maximum system Voltage of 440V (for minimum 5 min).
4.6	Operating Frequency	50 Hz± 5%.
4.7	Power Consumption	Voltage circuit: Maximum 5.0 W and 15 VA Current Circuit :0.08% of Vref*Imax (The additional power requirement during data transmission shall not exceed 7W per communication module).
4.8	Starting Current	20mA (0.2% of Ib) (better than IS requirement preferrable)
4.9	Short time over current	3000 A for 0.01 sec (30Imax for one half cycle at rated frequency)
4.10	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature at 45^0 C.
4.11	Rated Impulse withstand voltage	6KV (shall be applied ten times with one polarity and then repeated with the other polarity.)

4.12	AC withstand voltage for 1 min	4 KV
4.13	Insulation resistance a) Between frame &current ,voltage circuits connected together:	5 M ohm
4.14	Mechanical requirements	Meter shall be in compliance with clause 12.3 of IS 13779
4.15	Resistance to heat and fire	The terminal block and Meter case shall ensure safety against The spread of fire. They shall not be ignited by thermal overload of live parts in contact with them as per IS 13779. Fire retardant material shall be used.
4.16	Protection against penetration of dust and water.	Degree of protection : IP 51 or better as per IS 12063/60529, but without suction in the meter. Meter shall comply with clause 6.9 and 12.5 of IS 13779. OEM who provides degree of protection higher than IP51 shall have first preference.
4.17	Resistance against Climatic influence.	Meter shall be in compliance with clause 12.6 of IS 13779.
4.18	Electromagnetic Compatibility (EMC)	Meter shall be in compliance with clause 4.5 and 5.5 of IS 15884
4.19	Accuracy requirements	Meter shall be in compliance with clause 11 of IS 13779.
4.20	Power factor range	Zero lag to Zero lead.
4.21	Energy measurement	Fundamental energy +Energy due to Harmonics
4.22	Connection Diagram	The connection diagram for the system shall be provided on terminal cover.
4.23	Self-Diagnostic feature	The meter shall have indications for un satisfactory /non-functioning of (i) Real Time Clock and calendar (ii) RTC battery (iii) Non Volatile Memory (iv) LCD segment check (v) Communication Card
4.24	Initial startup of meter	Meter shall be fully functional within 5 sec after reference Voltage is applied to the meter terminals.
4.25	Alternate mode of supply to the meters	In case of power failure, reading/data shall be to downloaded with the help of battery of long life(minimum ten years) through Optical port in Battery mode.
4.26	Sleep Mode	Meter shall not go in sleep mode .Display should not be "OFF at any point of time when power up.
4.27	Internal diameter of the terminal holes Depth of the terminal holes	9.5mm (minimum) 25 mm
4.28	Clearance and creepage distance between adjacent terminals	10 mm (minimum) Or better than IS

4.29	Display	Backlit LCD, Scrolling, 10 seconds for each parameter minimum 7 Digits LCD display. The back lit preferably in green color.
4.30	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication.
4.31	Software and communication compatibility	The bidder shall supply software required for communication though local (CMRI and BCS software) and remote (AMI) connectivity free of cost and necessary training. For existing meter manufacturer, it should be ensured that all meters (existing non-smart & upcoming smart meters) can be read through one BCS only.
4.32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However parameters like RTC, TOD slots & timings, DIP (billing & load survey), MD reset, billing date change, relay connect/Disconnect, Set load limit, Pre paid/post paid, Set metering mode (Import/Export), display setting, shall be reconfigure through BCS/CMRI and remotely over the air (OTA), and any other support will be provided without any additional cost to TATA power till the useful life of the meters. Change in display setting shall be done through firmware upgrade by means of BCS/CMRI/Mobile app and remotely over the air (OTA). Meter data will not get reset while firmware upgrade. Display sequence for different categories like Net meter and LT2 part is given in the document.
4.33	Usage Application	Indoor and Outdoor
4.34	Ultrasonic welding	Meter cover and body should be Ultrasonic/chemical welded Opaque design shall have first preference.
4.35	Meter Dimension in MM	Is not more than NF
4.36	Real Time clock	Accuracy of RTC Should be as per CBIP-325 report and shall not vary by ± 7 min per year. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. Meter shall support RTC sync request from HES also.
4.37	KVAH & KVA calculation	Meter shall be programed as Lag+ Lead configuration i.e. Leading PF shall not be considered as unity.

		The same shall be displayed in BCS.
4.38	NO display	Meter Should design such a way, if meter found no display then after meter data retrieved from optical port.
4.39	Communication module of meter for AMI	As per clause no 1.2 (b) of IS 16444. Meter should have provision of communication module compatible with both the variant mentioned in IS 16444 PART-1. The Communication Network Interface Card (NIC) shall be 4G LTE with fallback provision to 2G or NbIOT and support all the bands offered by TSP's in India. It should be plug-in type and field hot swappable with cellular technology NIC of all type of meters of same make. Support for upgrade to 5G should be there without replacing the meter. Meter should be able to provide required power supply to NIC card. There shall not be an interlock while removing NIC card module with opening meter terminal cover.
4.40	Communication Layer Protocol	Should be as per clause 9.3 of IS 16444
4.41	Key Management and Security Feature	Should be as per IS 15959
4,42	Harmonics recording	The meter should record the current and voltage THD. The meter should record harmonics up to 20^{th} harmonic Average THD of all phase for voltage THD and current THD. THD values shall have 30 minutes integration period in load survey. Accuracy of harmonics recording shall be as per meter accuracy class. The meter shall generate a flag whenever the threshold (user configurable) of the 5% THD of the load current and voltage is breached
4.43	Meter Category	D2 – The same shall be displayed in BCS
4.44	Load switch utilization category	UC2 or better

5 Disconnection Switch

The meter shall have the facility of disconnecting and re-connecting the load of the meter from the remote and by authenticated command through Laptop/HHU at site by means of a built-in switch/relay.

This operation shall be conducted with the help of a third party software which is owned by TATA POWER and in addition to the manufacturer's own software, in Cellular (GPRS/ 3G / 4G / LTE) which can be given through optical port using external modem by utility.

Each operation of the switches shall be logged by the meter as an event with date and time stamp and reading parameters. This operation should be in line with clause 11 of IS 16444 PART-1, however over current tripping should be disabled by default while supply and should have easy enabling provision in feature. Enabling and Disabling configuration setting change By Tata Power whenever required remotely over the air (OTA). The Tata Power will decide the enabling of disconnection based on statuary guidelines and changes in future. The cumulative number of ON/OFF operations shall also be made available in meter data and HES.

Logging of load switch profile shall be made available at BCS//HES end along with date/time stamping & instantaneous parameters like voltage, current, energies (Kwh& KVAH).

Load switch shall be in "Normally Closed" position.
The make of the load switch should be of reputed make like Grooner (German) or equivalent and same shall be confirmed by the bidder during tendering. Switch shall be in compliance to IS 15884. The brief technical particulars of this Disconnector/load switch are furnished below, bidders to comply for the same:-

S.No.	DESCRIPTION	REQUIREMENT
1	Operating Voltage range	130 V to 470 V
2	Operating Current range	20 mA to 120 A
3	Maximum switching power	22 kVA per phase/ per IS 15884 Annex G
4	No. of poles	3 nos (one in each R,Y,B phases)
5	Operation of switches	Simultaneous
6	Utilization Categories	UC2 or better
7	Min. number of operation	3000 (close, open each)

6 Immunity against external influencing signals:

6.1 Magnetic Field:

Meter shall be immune to magnetic field such that it shall not affect the normal overall functionality.

Meter shall comply test of effect due to influence quantities as per latest CBIP amendments.

Meter shall show "Magnet" or appropriate icon under display sequence in the display during magnet event.

The effect on the meter due to magnetic induction of external origin as obtained by the method detailed below shall be determined.

6.1.1 The continuous (DC) "Stray" magnetic induction of 67 m T ± 5% shall be obtained at a distance of 5 mm from the surface of the pole of the electromagnet according to Appendix E of CBIP 325 document, energized with a DC current. The magnetic field shall be applied successively to all the

surfaces of the meter. The value of the magneto motive force to be applied shall be generally 1000 ampere-turns. However, considering the non-linearity of magnetization of the core, the ampere-turn might require slight adjustment to achieve the desired output.

6.1.2 The continuous (DC) "abnormal" magnetic induction of 0.2 Tesla ± 5% shall be obtained at a distance of 5 mm from the surface of the pole of the electromagnet according to Appendix E of CBIP 325 document, energized with a DC current. The magnetic field shall be applied successively to all the surfaces of the meter. The value of the magneto motive force to be applied shall be generally 10000 ampere-turn. However, considering the non-linearity of the magnetization of the core, the ampere-turns might require slight adjustment to achieve the desired output.

In the event of logging of presence of abnormal magnetic induction with date & time the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325 document, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and Cos Ø = 1.

6.1.3 The alternating (a.c) "stray" magnetic induction of 0.5 mT ± 5% shall be obtained by placing the meter in the center of circular coil, 1 m in mean diameter, of square section of small radial thickness relative to the diameter, and having 400 ampere-turns.

6.1.4 The alternating (AC) "abnormal" magnetic induction of 10 milli Tesla shall be obtained by placing the meter at various orientations in the center of a circular coil as specified in 6.1.2, but with 2800 ampere-turns produced by a current of the same frequency as that of the voltage applied to the meter and under the most unfavorable conditions of phase and direction.

In the event of logging of presence of abnormal magnetic induction with date & time the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325 document, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and cos Ø=1.

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

Consumption during magnet temper shall be recorded in defraud register also. Demand shall be recorded as per actual load only.

6.2 Electrostatic Discharge (ESD)

Meter along with NIC shall be immune up to 35 kV and shall record accurate energy as per IS-13779:2020. Meter shall log the event into memory as 'ESD' with date & time stamp for any ESD greater than 35 kV and shall show 'ESD' in the display and should log in suitable compartment (Abnormal Interference at BCS end).

The shielding around the meter shall be such that it does not get affected by high voltage, high and low energy impulse when comes in contact with meter from any side.

The meter should immune to high/ low frequency Jammer devices. Meter shall log event in its memory as jammer with date and time stamp along with snapshot.

6.3 Neutral Disturbance

The meter shall log in the memory as 'NEUTRAL DISTURBANCE' with date and time stamp and show 'ND' in the display for Frequency variation below 45 Hz and above 55 Hz with time delay of 1 min and for Pulsating DC and Chopped AC of any value with time delay of 1 min.

The meter shall not saturate on passage of direct current, which can cause the meter either to stop recording/ record inaccurately. DC injection shall be tested both in phase and neutral. Measurement by meter shall not get influenced by injection of DC signal/ DC pulse upto 330V and for any value beyond this, the meter shall log the event into memory as 'NEUTRAL DISTURBANCE' with date & time stamp and shall show 'ND '/ suitable information in the display after time delay of 1 min(occurrences and restoration time).

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

6.4 Abnormal and Tamper conditions

The meter shall record forward energy under any abnormal conditions.
All the tamper events i.e. shall be logged in the memory of the meter with date and time stamp of occurrence and restoration along with instantaneous electrical parameter (3ph. Voltage, 3ph. Current, Neutral Current, kWh, kVarh (Lag), kVarh (Lead), kVAh Energies, 3Ph. PF).
Meter shall store cumulative count and cumulative durations all the tamper event which have logged by meter from the date of energization till life of meter.

Tamper count shall be incremented only on the occurrence of the any tamper event with date and time
Stamp on FIFO basis. The event which is not restored should not be removed from its meter memory and
FIFO should not applicable for unrestored event.
The cover open tamper detection should be through heavy duty, sturdy micro switch such that it should not
Operate on vibration or impact during handling or testing.
The meter shall register correctly if supply neutral is not available at the meter neutral terminal. The meter shall work in absence of two incoming wires. It shall keep recording correctly in case of unbalance system voltage.

The meter shall keep working accurately irrespective of the phase sequence of the supply.

The meter shall be able to differentiate between actual CT reversals and condition arising out of unbalanced / unhealthy capacitor bank.

During Voltage Failure event, the meter shall record energy proportional to the current and V Ref (240V).
Meter shall have neutral CT for tamper identification and analysis.
The event compartments shall be IS 15959 Part-1 table 9. The size of compartments should be such that all above event are accommodated in the assigned event compartment. i.e. if in case of voltage compartment assigned to 4 number of events then the minimum size of this compartment should be such that it should accommodate sum of all maximum number of events as per below table.

All Transactional/Programing related events and Control events for Connect/Disconnect to be logged in BCS/HES along with date/time stamping and instantaneous parameters.
Suitable nomenclature/icon shall be displayed on meter display for Magnet, HV ESD, Neutral Disturbance, Meter cover open related events.
There should be provision to provide separate transaction count for Transaction & Firmware upgrades on display, however, at BCS end cumulative programming count (Transaction + Firmware upgrades) should be provided.

Persistence time for occurrence and restoration for the events and compartment block size shall be as per table given below

Compartment size	
Voltage related events	100
Current related events	100
Power failure related events	30
Transaction related events	20
Other events	50
Non-rollover events	1
Control events for Connect/Disconnect	10

Sr. No.	Tampers/ Failures	Phase wise	Compartment Size	Logic/ Condition other than standard	Persistence time	
					Occ Time (min)	Rec Time (min)
1	Voltage Failure	YES	25	Occ: Voltage <192V: and current > 2% Ib.	5	5
				Res: Vph > 191V (Independent of current)		
2	Voltage unbalance	YES	25	Occ : (Vmax-Vph)>10% Vn and Vphase : 191>Vphase< 216	5	5
				Res : (Vmax-Vph)<10% Vn and Vphase : 191<Vphase> 216		
3	High Voltage	YES	25	Vph > 110% of Vref	30	30
4	CT open	YES	25	Occ: Ir+Iy+Ib+In>10% of Ib(vector Sum) and phase current<10% Ib with all current are positive	30	30
				Res: Ir+Iy+Ib+In<5% of Ib(vector Sum) and phase current>10% Ib with all current are positive		
5	Current unbalance	YES	25	Occ : Imax – Imin > 30% of Iavg	15	15
				Res : Imax – Imin < 30% of Iavg		
6	CT Bypass	YES	25	Occ: Ir+Iy+Ib+In>5% of Ib(vector Sum) and phase current>10% Ib with all current are positive	30	30
				Res: Ir+Iy+Ib+In>2.5% of Ib(vector Sum) and phase current<10% Ib with all current are positive		
7	Current reversal	YES	25	1. Active current negative	2	2
				2. PF > 0.3		
8	Magnet	NO	25	Whenever meter sense magnetic field it shall record Active and Apparent energy at Imax at UPF	Immediate	Immediate

9	Neutral Disturbance	NO	25	Vph > 150% Vref In case of external signal injection (Chopped DC, Chopped AC and DC injection through diode)	5	5
10	ESD/JAMMER	NO	25	Occ: Immunity upto 50 KV, > 50KV event logged In memory Res: Removal of ESD and Jammer Device	2	2
11	Low PF Tamper	YES	25	OCC: PF < +/- 0.5 and I>1%Ib REC: PF > +/- 0.7 and I>1%Ib	5	5
12	Top Cover open	NO	1	When cover opens by more than 2 to 4 mm.	Immediate	NA
13	Temperature Rise	NO	25	Occ: T > 70˚C REC: T < 60˚C	2	2
14	NIC card Removed (Immediate)	NO	25	OCC: On removal of card RES: On Insertion card	Immediate	Immediate
15	Power On/Off	NO	25	Occ: Actual voltage OFF Res: Actual voltage ON	5	5

Note: If any change in tamper logic is required, TPC shall inform to successful bidder during PO placement or before starting of manufacturing as per requirement. Successful bidder shall make necessary changes according to TPC requirement.

7 General Technical Requirements

The Meter shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially personal safety against electric shock, safety against effect of excessive temperature, protection against spread of fire, protection against penetration of solid objects, dust and water.
All parts, which are subject to corrosion under normal working conditions, shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling or damage due to exposure to air, under normal working conditions. Meter shall withstand Solar radiation.

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components.
There should not be any connector or joint in CT secondary connection and shall be soldered directly on PCB.
The battery cell shall be button/coin type leak proof.

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

S No	Component Function	Requirement	Makes and Origin
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	USA: Anolog Devices, Cyrus Logic, Atmel, Phillips, freescale,NXP South Africa: SAMES Japan: NEC, Renesas
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, Onsemi Japan:Hitachi or Oki Europe: SGS Thomson
3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	Taiwan: Holtek Singapore: Bonafied Technologies Korea: Advantek China:Xiamen
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	USA: National Semiconductors Holland / Korea: Phillips Taiwan: MAXIM, Everlight Japan:Hitachi, Everlight
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm. and Conformal coating	A class vendor

		required to protect from Environment like moisture	
6.	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments, Rohm,Micron Japan:Hitachi, Oki, AVX or Ricoh Korea: Samsung
7.	Battery	Lithium with guaranteed life of 15 years	Varta / Tedirun /Sanyo/EVE / XENO, Mitsubishi or equivalent.
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips , Dallas, Atmel, Motorola Japan: NEC or Oki
9.	Temperature Sensor	Temperature sensor shall be internal to the meter and its accuracy shall be as per relevant IEC / IS standards. The OEM test report to be furnished.With good performance till life of meter.	USA: Philips , Dallas, Atmel, Motorola Japan: NEC or Oki

Note: The makes of the components are in the preferential order.
Vendor shall submit list of components with makes to TPC during sample meter evaluation and FAT.

8 Meter Body:

Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II)with FVo Fire Retardant, self-extinguishing, UV stabilize, recyclable and Anti oxidation properties. The minimum thickness of the meter enclosure shall be 2mm.Meter base shall be opaque with polycarbonate LEXAN 500R or better on prior approval from the Purchaser. Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the Purchaser. Meter cover & base shall be provided with continuous and seamless Ultrasonic/chemical welding such that it is not opened without breaking the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence. The damage evidences should be visible externally& should be traceable in such a way that attempts can be proved in court of law. The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s). Unidirectional screws to be used on meter covers where ever required.

However meter with opaque encapsulated design/integrated base and cover (single enclosure) would be highly preferred, thus nullifying the possibility of opening of meter case. The meter body shall be such that the liquid or chemical shall not reach the electronic part PCB, processor and display from meter terminal and push button.
Optical port of meter shall be metallic to hold magnetic optical cord during data downloading locally.

9 Terminals, Terminal Block

Terminal block should be in single mould with meter body base(Not separate). After any attempts the terminal block should not be able to disengaged, opened or loosen from any side. Any attempt to disengage the terminal block should certainly damage the meter body with physical evidences. The damage evidences should be visible externally& should be traceable in such a way that attempts can be proved in court of law.

Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block adequate testing of materials shall be taken into account. Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the test given in ISO 75 for temperature of 180°C and pressure of 1.8 M Pa. The terminal block shall be of opaque with polycarbonate LEXAN500Ror equivalent on prior approval from the Purchaser.

The terminals shall be marked properly on the terminal block for making external connections.
The terminals and connections shall be suitable to carry up to 120 Amp continuously (Imax 100 A). The size, design & material of terminal so that temperature rise will not be more than 20 ˚C above ambient temperature of 45˚C at 120% of I max loading for 06 hrs continuous.
Temperature sensor shall be available in meter for sensing the temperature and meter should be programmed in such way that on reaching the threshold value set (as per tamper table) the event/alert should go the to HES/MDMS.
The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.

The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Terminals shall be preferably of MS cage clamp type as per IS: 15707or of flat end screw with at least 9 mm dia of screw for better contact area.
Internal diameter of the terminal holes shall be minimum 9.5 mm; minimum clearance between adjacent terminals shall be 10 mm. Depth of the terminal holes shall be of 25 mm.
Terminal screws shall be of Zinc plated MS bottle type.
Meter terminal should have 8pin arrangement consisting of neutral and neutral S2 shorted inside the meter. All terminal should be in one row only.

Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.
The preferred arrangement of terminals shall be linear. Minimum two number of terminal screws to be provided per terminal wire

9.1 Terminal Cover:

Terminal cover shall be of short type and shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the Purchaser. Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be as per the Purchaser approval). After sealing the cover, terminals shall not be accessible without breaking the seals. Terminal Cover with C cut to enable smooth insertion of cable in the terminals.

Length of terminal cover shall not be more than 50 mm length from bottom of terminal block in line with meter base.
The terminal cover should open on the top side, during connection of the cables. The side opening of terminal cover is not acceptable due to additional opening space requirement

9.2 Sealing of meter

Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. For this, one no. Polycarbonate seal left side and one no. Hologram seal on right side shall be provided by the Bidder.
Additional Hologram seals will be provided by TPC to supplier for putting them on meter body as per requirement at Factory. Reconciliation of seals shall be provided by bidder after its usage.
All the seals shall be fixed on meter body by the bidder at his works before dispatch.
Two sealing provision shall be provided at meter terminal cover, such that terminal shall not be accessible without breaking the seals. All the seals shall be provided on front side only and as per the Purchaser specification. Rear side sealing arrangement shall not be accepted.
Bidder shall provide seals be as per CEA regulation (2006). Only patented seals to be used as per CEA requirements.

Plug in type NIC card cover should have proper sealing arrangement and should be sealed with manufacturer's polycarbonate seal.
The bidder shall provide the soft record of polycarbonate seal, Manufacturers and TPC hologram seal serial number, NIC card serial number and box packing list used against each meter serial number along with its position in tabular form for every lot of meter.

The manufacture should provide manufacture Hologram seal as and when required by TPC within week.

10 TOD Feature:

The meter shall be capable of measuring Cumulative Energy (KWh), Kvah and MD (KW, KVA)with time of day (TOD) registers having 5 zones (no. of zones & time slot shall be programmable by BCS,CMRI, Mobile App, OTA with adequate security level).
TOD Slot Configuration shall be as follows-

Slot	Time Slots
TOD 1	22 to 06 Hrs
TOD 2	06 to 09 Hrs
TOD 3	09 to 12 Hrs
TOD 4	12 to 18 Hrs.
TOD 5	18 to 22 Hrs

11 MD Integration:

The MD integration period shall be 15 minutes (integration period-programmable by CMRI at site and also thru AMR with adequate security level). The MD resetting shall be automatic at the 1st of the month i.e. 0000 hours of 1st day of the month. Manual MD reset button functionality shall not be available. Last 12 MD values shall be stored in the memory. MD shall be recorded and displayed with minimum three digits before decimal and minimum three digits after decimal points. MD integration shall be Block Type Demand.

12 Parameters In BCS

All these parameters shall be downloaded locally or remotely. All the parameters shall be recorded in its NVM(Non Volatile Memory). NVM shall have minimum retention time of 10 Years. Below mention current, history billing data and at least 25 tamper event for each tamper shall be available In NVM.

NVM OK/Fail status or flag shall be made available at BCS end for better data analysis. Preference shall be given to bidder who provides CAIDI profile, Max outage duration, time of max outage & its histories at BCS end.

12.1 Billing Information

Current+ 12 Month History billing Date

Current + 12 Month History of Energy (KWH, KVAH, KVARH Lag, KVARH Led, Def KWH, Def KVAH)

Current + 12 Month History Consumption (KWH, KVAH, KVARH Lag, KVARH Led, Def KWH, Def KVAH)

Current + 12 Month History of Demand (KW,KVA, KVAR Lag, KVAR led) Along with date and time stamp

Current + 12 Month History of PF

Current + 12 Month History of Disconnected switch cumulative count.

12.2 TOD wise billing Information

Current + 12 Month History of Energy (KWH, KVAH)

Current + 12 Month History of Consumption (KWH, KVAH)

Current + 12 Month History of Demand (KW, KVA) along with date and time stamp

Current + 12 Month History of PF

12.3 Load survey:

The meter shall be capable of recording load profile of atleast 35 days for 15 min IP for ON days only for following parameters.

a. KWH
b. KVAH
c. KVARH Lag

d. KVARH Led
e. KW
f. KVA
g. KVAR Lag
h. KVAR Led
i. Phase wise PF
j. Voltage for each Phase
k. Current for each Phase
l. Neutral current
m. THD Voltage phase wise
n. THD Current phase wise
o. Temperature

Note: In addition to Billing Load Survey Profile, additional logger profile should be configurable for Instantaneous Parameters for 5/15/30 Min.

Instantaneous parameters (from point no. j to n) can be configured for minimum/ maximum/ average for the configured integration period.

12.4 MID Night Energy:

Meter shall be capable of recording daily Midnight Energy(KWH, KVAH) 00:00 to 24:00 Hrs for 35 power ON days.

12.5 Instantaneous Parameters:

Meter shall have capable following Instantaneous parameter In Memory and should be available in BCS

Meter Serial No
Meter Type
Meter date and Time
MRI date and time
Dump date and time
Voltage of each Phase
Line Current of each Phase
Active Current of each Phase
Reactive Current of each Phase
Actual Neutral current
Power factor of each Phase
Average Power Factor
Instantaneous Frequency
Instantaneous Load (KW, KVA, KVAR Lag, KVAR Led)
Present Cumulative energy(KWH, KVAH, KVARH Lag, KVARH Led, Def KWH, Def KVAH)
Cumulative Tamper count
Cumulative Billing Count
Cumulative Programming Count
Vector/Phasor diagram
Terminal Block Temperature

No. of relay switch operation Count
Load limit value in KW
Relay connection status (Connected/Disconnected)
Metering mode
THD current (Phase wise & average)
THD voltage (Phase wise & average)
THD power(Phase wise & average)
Separate Event count (voltage unbalance, overcurrent, CT open/By pass,low voltage etc.)

12.6 General Information:-

Meter shall be capable for providing below mention general parameters in memory should be available in BCS

Meter serial No
Meter Type
Manufacture Name
Manufacture date
Meter Class
Meter constant
Meter voltage rating
Meter current rating
Firmware version of meter
Available TOD profile showing timing and seasons
Available Meter display sequence preferrable

12.7 Transactions:-

All the change in software of meter to be logged along with date and time stamp and instantaneous parameters.

12.8 Load switch profile:-

All energy & demand parameters alongwith date time stamping shall be available with status of Relay connect/disconnect.

13 Display units:

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

Display shall have minimum 7 digits before decimal for energy register, 3 digits before & 3 digits after decimal place in the display for demand register, 2 digits before & 5 digits after decimal place in the display for High resolution energy registers, 3 digits before decimal & 3 digit after decimal for Voltage, 3 digits before decimal & 3 digit after decimal for Current, 1 digits before decimal & 3 digit after decimal for PF, 3 digits before decimal & 3 digit after decimal for Power, size of the digits shall be minimum 10mmx6mm. Cumulative energy (KWh) shall be displayed without decimal in auto scroll mode

Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (I.e. if MD1 is displayed in Auto scroll mode, Header (MD1) and value (say 5.23 KW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 30 sec, if push button is not operated.

1. **Default Display sequence –**

Display1 Parameters (Auto Scroll Mode)
Cumulative Forward kWh (7+1)

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Phase wise Voltage
Instantaneous Phase wise Current
Instantaneous Neutral Current
Instantaneous Active power
Instantaneous Reactive power
Instantaneous Apparent power
Instantaneous Phase wise PF
Cumulative Forward kWh (7+1)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh

TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Average PF
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh
Latest reset-TOD 2 Forward kWh
Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time
Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Latest reset- Average PF
Rising Demand Forwared kVA
Connection Check
Voltage Phase sequence
Current Phase sequence
Previous reset- Forward kWh
Previous reset- Tariff wise Forward kWh
Previous reset - Forward Kvarh Lag
Previous reset- Tariff wise MD forward KVA Date & Time
Previous reset- Forward Kvarh Lead
Previous reset - Forward Kvah
Previous reset - Tariff wise Forward Kvah
Previous reset - Average PF
MD reset count
Defrauded Energy cummulative Kwh
Defrauded Energy cummulative Kvah
Cummulative Tamper count
History of last 3 tampers
Defraud Register Cumulative kWh during Magnetic Tamper (6+2)
Defraud Register Cumulative kWh during ND Tamper (6+2)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest ND tamper occurrence Date & time

Latest ND tamper recovery Date & time
Cover Open tamper occurrence Date & time
Status of Load Switch
Count of Relay connect
Latest Occurrence Relay connect Date & time
Count of Relay disconnect
Latest Occurrence Relay disconnect Date & time
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display3 Parameters (High Resolution Mode)
Cumulative Forward kWh (2+5)
Tariff wise Forward kWh (7+1)
Cumulative Forward kVArh lag (2+5)
Tariff wise Reset Period MD Forward kVA Date & time (3+3)
Cumulative Forward kVArh lead (2+5)
Cumulative Forward kVAh (2+5)
Tariff wise Forward kVAh (7+1)
Battery mode will be as per display 1, 2 and 3 sequentially.

Meter shall be unidirectional by default unless specified. However it can be programmed through BCS, HHU, Mobile App and OTA.

2. **Display sequence for LT 2 part (programmable through firmware upgrade) –**

Display1 Parameters (Auto Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Cumulative Forward kWh (7+1)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag

Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Average PF
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh
Latest reset-TOD 2 Forward kWh
Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time
Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Latest reset- Average PF

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Phase wise Voltage
Instantaneous Phase wise Current
Instantaneous Neutral Current
Instantaneous Active power
Instantaneous Reactive power
Instantaneous Apparent power
Instantaneous Phase wise PF
Cumulative Forward kWh (7+1)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh

TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Average PF
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh
Latest reset-TOD 2 Forward kWh
Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time
Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Latest reset- Average PF
Rising Demand Forwared kVA
Connection Check
Voltage Phase sequence
Current Phase sequence
Previous reset- Forward kWh
Previous reset- Tariff wise Forward kWh
Previous reset - Forward Kvarh Lag
Previous reset- Tariff wise MD forward KVA Date & Time
Previous reset- Forward Kvarh Lead
Previous reset - Forward Kvah
Previous reset - Tariff wise Forward Kvah
Previous reset - Average PF
MD reset count
Defrauded Energy cummulative Kwh
Defrauded Energy cummulative Kvah
Cummulative Tamper count

History of last 3 tampers
Defraud Register Cumulative kWh during Magnetic Tamper (6+2)
Defraud Register Cumulative kWh during ND Tamper (6+2)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest ND tamper occurrence Date & time
Latest ND tamper recovery Date & time
Cover Open tamper occurrence Date & time
Status of Load Switch
Count of Relay connect
Latest Occurrence Relay connect Date & time
Count of Relay disconnect
Latest Occurrence Relay disconnect Date & time
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
Error Code- Meter and NIC health indicator

Display3 Parameters (High Resolution Mode)
Cumulative Forward kWh (2+5)
Cumulative Forward kVArh lag (2+5)
Cumulative Forward kVArh lead (2+5)
Cumulative Forward kVAh (2+5)
Battery mode will be as per display 1,2 and 3 sequentially.

3. Display sequence for Net meter (programmable through firmware upgrade) –

Display1 Parameters (Auto Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Cumulative kWh (7+1) - Import
TOD 1 kWh - Import
TOD 2 kWh - Import
TOD 3 kWh - Import
TOD 4 kWh - Import
TOD 5 kWh - Import
Cumulative kVArh lag - Import
Tariff wise MD kVA Date & time - Import
Cumulative kVArh lead - Import

Cumulative kVAh - Import
TOD 1 kVAh - Import
TOD 2 kVAh - Import
TOD 3 kVAh - Import
TOD 4 kVAh - Import
TOD 5 kVAh - Import
Cumulative kWh (7+1) - Export
TOD 1 kWh - Export
TOD 2 kWh - Export
TOD 3 kWh - Export
TOD 4 kWh - Export
TOD 5 kWh - Export
Cumulative kVArh lag - Export
Tariff wise MD kVA Date & time - Export
Cumulative kVArh lead - Export
Cumulative kVAh - Export
TOD 1 kVAh - Export
TOD 2 kVAh - Export
TOD 3 kVAh - Export
TOD 4 kVAh - Export
TOD 5 kVAh - Export
Average PF
KVA Rising demand

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Phase wise Voltage
Instantaneous Phase wise Current
Instantaneous Neutral Current
Instantaneous Active power
Instantaneous Reactive power
Instantaneous Apparent power
Instantaneous Phase wise PF
Net Average PF
Rising Demand Forwared kVA
Latest reset- Cumulative kWh (7+1) - Import
Latest reset- TOD 1 kWh - Import
Latest reset- TOD 2 kWh - Import
Latest reset- TOD 3 kWh - Import
Latest reset- TOD 4 kWh - Import

Latest reset- TOD 5 kWh - Import
Latest reset- Cumulative kVArh lag - Import
Latest reset- Tariff wise MD kVA Date & time - Import
Latest reset- Cumulative kVArh lead - Import
Latest reset- Cumulative kVAh - Import
Latest reset- TOD 1 kVAh - Import
Latest reset- TOD 2 kVAh - Import
Latest reset- TOD 3 kVAh - Import
Latest reset- TOD 4 kVAh - Import
Latest reset- TOD 5 kVAh - Import
Latest reset- Cumulative kWh (7+1) - Export
Latest reset- TOD 1 kWh - Export
Latest reset- TOD 2 kWh - Export
Latest reset- TOD 3 kWh - Export
Latest reset- TOD 4 kWh - Export
Latest reset- TOD 5 kWh - Export
Latest reset- Cumulative kVArh lag - Export
Latest reset- Tariff wise MD kVA Date & time - Export
Latest reset- Cumulative kVArh lead - Export
Latest reset- Cumulative kVAh - Export
Latest reset- TOD 1 kVAh - Export
Latest reset- TOD 2 kVAh - Export
Latest reset- TOD 3 kVAh - Export
Latest reset- TOD 4 kVAh - Export
Latest reset- TOD 5 kVAh - Export
Latest reset Average PF
Previous reset- Cumulative kWh (7+1) - Import
Previous reset- TOD 1 kWh - Import
Previous reset- TOD 2 kWh - Import
Previous reset- TOD 3 kWh - Import
Previous reset- TOD 4 kWh - Import
Previous reset- TOD 5 kWh - Import
Previous reset- Cumulative kVArh lag - Import
Previous reset- Tariff wise MD kVA Date & time - Import
Previous reset- Cumulative kVArh lead - Import
Previous reset- Cumulative kVAh - Import
Previous reset- TOD 1 kVAh - Import
Previous reset- TOD 2 kVAh - Import
Previous reset- TOD 3 kVAh - Import
Previous reset- TOD 4 kVAh - Import
Previous reset- TOD 5 kVAh - Import
Previous reset- Cumulative kWh (7+1) - Export
Previous reset- TOD 1 kWh - Export

Previous reset- TOD 2 kWh - Export
Previous reset- TOD 3 kWh - Export
Previous reset- TOD 4 kWh - Export
Previous reset- TOD 5 kWh - Export
Previous reset- Cumulative kVArh lag - Export
Previous reset- Tariff wise MD kVA Date & time - Export
Previous reset- Cumulative kVArh lead - Export
Previous reset- Cumulative kVAh - Export
Previous reset- TOD 1 kVAh - Export
Previous reset- TOD 2 kVAh - Export
Previous reset- TOD 3 kVAh - Export
Previous reset- TOD 4 kVAh - Export
Previous reset- TOD 5 kVAh - Export
Previous reset Average PF
Connection Check
Voltage Phase sequence
Current Phase sequence
MD reset count
Defrauded Energy cummulative Kwh
Defrauded Energy cummulative Kvah
Cummulative Tamper count
History of last 3 tampers
Defraud Register Cumulative kWh during Magnetic Tamper (6+2)
Defraud Register Cumulative kWh during ND Tamper (6+2)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest ND tamper occurrence Date & time
Latest ND tamper recovery Date & time
Cover Open tamper occurrence Date & time
Status of Load Switch
Count of Relay connect
Latest Occurrence Relay connect Date & time
Count of Relay disconnect
Latest Occurrence Relay disconnect Date & time
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display3 Parameters (High Resiolution Mode)

Cumulative Forward kWh (2+5) - Import
Cumulative Forward kVArh lag (2+5) - Import
Cumulative Forward kVArh lead (2+5) - Import
Cumulative Forward kVAh (2+5) - Import
Cumulative Forward kWh (2+5) - Export
Cumulative Forward kVArh lag (2+5) - Export
Cumulative Forward kVArh lead (2+5) - Export
Cumulative Forward kVAh (2+5) - Export
Battery mode will be as per display 1,2 and 3 sequentially.

For Net meter mode, Both Import and export energy recording shall be applicable in this mode of metering and relevant registers like Billing, LS, tamper logics etc shall be updated and shall be available in BCS also

Note: Latest reset is History 1 & Previous reset is History 2

4. Display sequence for Pre Paid meter (programmable) –

Display1 Parameters (Auto Scroll Mode)
Cumulative Forward kWh (7+1)
Last token recharge amount
Last token recharge time and date
Total amount at last recharge
Current balance amount
Current balance Time and date

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Phase wise Voltage
Instantaneous Phase wise Current
Instantaneous Neutral Current
Instantaneous Active power
Instantaneous Reactive power
Instantaneous Apparent power
Instantaneous Phase wise PF
Last token recharge amount
Last token recharge time and date
Total amount at last recharge
Current balance amount
Current balance Time and date
Cumulative Forward kWh (7+1)

TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Average PF
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh
Latest reset-TOD 2 Forward kWh
Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time
Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Latest reset- Average PF
Rising Demand Forwared kVA
Connection Check
Voltage Phase sequence
Current Phase sequence
Previous reset- Forward kWh
Previous reset- Tariff wise Forward kWh
Previous reset - Forward Kvarh Lag
Previous reset- Tariff wise MD forward KVA Date & Time
Previous reset- Forward Kvarh Lead
Previous reset - Forward Kvah
Previous reset - Tariff wise Forward Kvah
Previous reset - Average PF

MD reset count
Defrauded Energy cummulative Kwh
Defrauded Energy cummulative Kvah
Cummulative Tamper count
History of last 3 tampers
Defraud Register Cumulative kWh during Magnetic Tamper (6+2)
Defraud Register Cumulative kWh during ND Tamper (6+2)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest ND tamper occurrence Date & time
Latest ND tamper recovery Date & time
Cover Open tamper occurrence Date & time
Status of Load Switch
Count of Relay connect
Latest Occurrence Relay connect Date & time
Count of Relay disconnect
Latest Occurrence Relay disconnect Date & time
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
RSSI Value
Error Code- Meter and NIC health indicator

Display3 Parameters (High Resolution Mode)
Cumulative Forward kWh (2+5)
Tariff wise Forward kWh (7+1)
Cumulative Forward kVArh lag (2+5)
Tariff wise Reset Period MD Forward kVA Date & time (3+3)
Cumulative Forward kVArh lead (2+5)
Cumulative Forward kVAh (2+5)
Tariff wise Forward kVAh (7+1)
Battery mode will be as per display 1, 2 and 3 sequentially.

All these parameters shall be downloaded locally or remotely and interpreted in PC/Laptop.

All the parameters shall be recorded and memorized in its Non-Volatile Memory (NVM). The corresponding non-volatile memory shall have a minimum retention time of 10 years.

Error code – Meter and NIC health indicator shall be displayed as following or any better provision-

SR No.	Error Code to be Displayed	Description
1	Err 00	All Good
2	Err 01	Meter NIC Communication failure
3	Err 02	Modem Initialization Failure
4	Err 03	SIM Not Detected
5	Err 04	SIM Invalid
6	Err 05	No GSM Network Coverage
7	Err 06	GPRS Network Registration failure
8	Err 07	GPRS Registration Denied
9	Err 08	No APN Configured
10	Err 09	GPRS Connection Not Established
11	Err 10	HES IP/Port not configured
12	Err 11	HES Port Not Open
13	Err 12	Any key Mismatch Between Meter and NIC

14 Output Device:

14.1 Pulse rate

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

Meter constant shall be as actual without multiplying factor.

14.2 Communication LCD indicator

The meter shall be provided with suitable LCD/ LED indication for communication in progress.

Meter shall display Communication status indications on LCD/ LED without affecting normal display parameters.

14.3 Load Switch LED indicator

The meter shall be provided with suitable LED LCD indication for condition of load switch (Close/open). LCD should show/work when load switch is open.

15 Name plate and Marking:

Meters shall have a name plate clearly visible and effectively secured against removal. The name plate data should be laser printed. No sticker to be used to avoid loss of data in event of fire. The base color of Name plate shall be white indelibly and distinctly marked with all essential particulars as per relevant standards along with the following. The Serial no. series applicable for the meters shall be provided by Tata Power.

i. Manufacturer's name
ii. Type designation
iii. Number of phases and wires
iv. Serial number (Meter serial number shall be laser printed on name plate instead on sticker).
v. Serial number along with barcode
vi. Month and Year of manufacture
vii. Unit of measurement
viii. Reference voltage ,frequency
ix. Ref. temperature
x. Rated basic and maximum Current
xi. Meter constant (imp/kWh)
xii. 'BIS' Mark
xiii. Class index of meter
xiv. Property of Tata Power Co. Ltd
xv. Purchase Order No. & date
xvi. Guarantee period.
xvii. Sign of double square
xviii. Country of manufacture.
xix. Firmware version of meter
xx. Meter category
xxi. Symbol of load switch.
xxii. NIC serial NO (Shall be visible from Communication Module Slot) along with barcode/ QR code
i. Compatibility of NIC Card.

Bidder should ensure that NIC provided in meters are having Sr. No., MFG date, Property of TATA POWER' marked, PO date and no. (same as that of meter PO)

16 Tests:

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

16.1 Routine Test

i.AC High Voltage test
ii.Insulation test
iii.Test on limits of error
iv.Test of starting current

v.Test of no load condition

16.2 Acceptance test:

i. AC High Voltage test
ii. Insulation test
iii. Test on limits of error as per IS load points for both Phase and neutral channel
iv. Test of meter constant
v. Test of starting current
vi. Test of no load condition
vii. Test of repeatability of error.
viii. Test of power consumption.
ix. Test for Immunity against external influencing signal as per the Purchaser specification
x. Test for Immunity against DC Immunity as per the Purchaser specification
xi. Test for Immunity against Tamper conditions as per the Purchaser specification
xii. Error measurements with abnormal condition
xiii. Test to Influence of Harmonics
xiv. Supply voltage and frequency variation test
xv. Testing of self-diagnostic features.
xvi. All tamper test, count increment and logging with date and time in meter database.
xvii. All tests defined in IS 15959(part-2):2016
xviii. Functionality of communication module is 16444 part2
xix. smart meter communicability as per provision of 28 IS 15959 (part-3)
xx. Physical check of NIC and replaceable ease of the NIC module in meter

16.3 Type test:

i. All tests as defined in IS16444 Part 1/IS 15959 Part 2/ IS 13779:2020 with latest edition.
ii. Test against abnormal magnetic influence as per CBIP TR 325 with Latest editions.
iii. DC immunity test (injection both on phase and neutral terminal)
iv. Test for Material used for Terminal Block and meter body as per relevant standards with Latest editions.
v. IP Test with Latest editions.

Note:- Bidder must mention IS 13779:2020 with latest edition in factory test report.

16.4 Special test:

i. The bidder shall demonstrate the communication capability of the meter through communication modes as defined in the specification before conducting acceptance tests. The bidder shall ensure that API (Application protocol interface) is compatible with TPC.
ii. Temperature rise of terminal block with 120% Imax for 6 hours on actual load on sample from first lot. Accuracy and temperature shall be analyzed before and after conducting test.

17 Type Tests Certificates:

The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA or

any NABL accredited lab as per the relevant standards. Type test should have been conducted in certified Test Laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPC.

18 Pre-Dispatch Inspection:

The successful bidder shall submit two prototype samples for further testing and compliance as per specifications and getting approval before mass manufacturing. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Bidder shall grant free access to the places of manufacture to TPC's representatives at all times when the work is in progress. Inspection by the TPC or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific DC (Dispatch Clearance) is issued by TPC.

Following documents shall be sent along with material

a) Test reports
b) MDCC issued by TPC
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)
i) Compatible BCS software
j) Meter user manual covering Technical Parameters, display, tamper logics, meter dimensions, etc
k) GTP (Guaranteed Technical Particulars)

19 Inspection After Receipt At Store:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection. The successful bidder shall submit two extra carton boxes (unpaid) per lot delivered (lot size shall be 2,000 numbers or as defined in the order)

20 Guarantee:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the purchaser up to a period of at least 60 months from the date of last supplies, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame not more than 1 month, and to the entire satisfaction of Tata Power, failing which Tata Power will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses

incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

Bidder shall own responsibility for all internal component with an end to end agreement with individual component manufacturer.

Bidder to collect all defective meters from stores for repairs as per defined timeframe and send those meters immediately after repairs.
Bidders to submit CAPA report of each defective meter and submit the same to Lab/Store representative along with dispatch of repaired meters.
Format of CAPA report-

S. No	Type	Meter No	Defects from Tata Power	Observations at OEM	Root-Cause by OEM	Corrective Actions taken by OEM	Preventive Actions taken by OEM

Meters to be designed in such a way that cases of No display/ Display faulty will be bare minimum or else Tata Power will liable to reject entire lot of meters.

Bidder shall further be responsible for 'free replacement/repairs" of entire lot of meters for any 'Latent Defects '(design issue due to faulty lot component) if noticed and reported by the purchaser within guarantee period.

Manufacture shall collect disputed meter from meter stores and provide testing report of disputed meter refer by TPC within 15 days period irrespective of guarantee period.

21 Packing:

Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The material used for packing shall be environmentally friendly.
Packing and transportation shall be as per IS 15707:206 clauses 9.1 and 9.2.
Routine test report of the individual meter shall be kept inside each card board carton of the meter.
The softcopy in PDF format, of the routine test certificate of each meter to be provided by bidder with each lot.

22 Tender Sample:

Bidders are required to manufacture 3 sample meters as per the TPC specification (sealed, unsealed and openable base and cover to view/test the inner circuits) and submit the sample (non-returnable) along with bid for approval.

Following accessories to be submitted along with sample

1. Test Reports of 3 sample meters (Type test, Acceptance test **)**

2. Detailed User Manual along with dimension
3. Guaranteed Technical Particulars
4. Tamper logic sheet
5. Display parameter sequence
6. BCS,MRI and Mobile App software for local reading, programming and connect/disconnect testing
7. Optical communication cords
8. Internal connection diagram
9. List and make of all electronics component used
10. Clause by clause compliance sheet of Technical Specification
11. Bidder shall be responsible for integration of Meters with NIC and TPC HES.

23 Quality Control:

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished.

Quality should be ensured at the following stages:
At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.
At insertion stage, all components should undergo computerized testing for conforming to design parameter and orientation.
Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipment (ATEs).
Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will beare kept in ovens for 24 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 24 hours meter should work satisfactorily)
The Purchaser's engineer or its nominated representative shall have free access to the bidder’s/manufacturer’s works to carry out inspections.

24 Minimum Testing Facilities:

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

25 Manufacturing activities:

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

26 Drawings:

Following drawings & Documents shall be prepared based on TPC specifications and statutory requirements and shall be submitted with the bid:

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

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

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

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

All the documents & drawings shall be in English language.

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

27 Guaranteed Technical Particulars:

S.No	**Description**	**Units**	**As Furnished by Bidder**
1	Type of meter		

2	Accuracy Class of the meter		
3	Ib & Imax	A	
4	Operating Voltage of Meter and communication unit	V	
5	Operating Frequency	*Hz*	
6	Power Consumption and Burden		
7	Starting Current	mA	
8	Short time over current	A	
9	Influence of heating		
10	Rated impulse withstand voltage	KV	
11	AC withstand Voltage for 1 min	KV	
12	Insulation resistance a) Between frame &Current, voltage circuits connected together:	M ohm	
13	Mechanical requirement as per IS 13779		
14	Resistance to heat and fire (As per specification)		
15	Degree of protection		
16	Resistance against climatic influence (as per IS 13779)		
17	Electromagnetic Compatibility (EMC)		
18	Accuracy requirements (As per IS 13779(latest Editions)		
19	Power factor range		
20	Energy measurement		
21	Connection Diagram for system on terminal cover	Yes/No	
22	Self diagnostic feature		
23	Initial start up of meter (meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals)		
24	Terminal block		

	a) Depth of the Terminal holes b) Internal diameter of terminal holes c) Clearance between adjacent terminals	mm mm mm	
25	Communication capabilities as per clause 5.0		
26	Immunity against abnormal Magnetic influence, as defined in Cl. 6.0.1		
27	Immunity against HV ESD as defined in Cl. 6.0.2		
28	DC Immunity as defined in Cl. 6.0.3		
29	Grade of material for a) Meter base b) Meter cover c) Terminal block d) Terminal cover		
30	Tamper counts		
31	Recording forward energy in all conditions.	Yes/No	
32	Makes of all components used in the meter.	Yes/No	
33	Non Volatile memory (Retention period)		
34	Measuring elements used in the meter		
35	Power supply to circuit in case of supply failure		
36	Display of measured values (As per specification – clause 13)	Yes/No	
37	LCD display (Type and viewing angle)		
38	Pulse rate	Imp/kWh, Imp/kVArh	

39	Name plate marking	Yes/No	
40	Routine test certificates	Yes/No	
41	Acceptance test certificates	Yes/No	
42	Type test certificates	Yes/No	
43	Guarantee certificates	Yes/No	
44	Display Sequence	Yes/No	
45	Tamper thresholds	Yes/No	
46	Ultrasonic Welding of cover and Base	Yes/No	
47	Fire retardant category of meter Body And terminal block		
48	Supply of jig for retrieval of Damaged/ burnt meter.		
49	Meter shall be programed for like RTC, TOD		
50	Dimension of meters L*B*H		
51	KVAH & KVA calculation		
52	Meter data retrieved if meter found no display	Yes/No	
53	RJ 11 Pin configuration as per TPC	Yes/No	
54	Make of Disconnector Switch		
55	Temperature Sensor inside Meter		
56	Output Device (LEDs) As per Cl 14		
57	NIC module with cover & sealing Arrangement		
58	Harmonics Recording- The recording		

	of harmonics up to 20th harmonic Average THD of all phase for voltage THD and current THD.		
59	Accuracy of harmonics recording		
60	Measuring element used		
61	Meter Category		
62	Load switch utilization category		
63	Calibration (programming)		
64	Usage application	Indoor/ Outdoor	
65	Ultrasonic welding		

Electronics parts

Sr NO	**Component Function**	**Requirement**	**Makes and Origin (to be provide by Bidder)**
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	
3.	Display modules	The display modules should be well protected from the external UV radiations The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	

4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm and Conformal coating required to protect from Environment like moisture	
6.	Electronic Components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	
7.	Battery	Lithium with guaranteed life of 15 years	
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	
9.	Temperature sensor	Temperature sensor shall be internal to the meter and its accuracy shall be as per relevant IEC / IS standards. The OEM test report to be furnished. With good performance till life of meter.	

28 Schedules Of Deviations:

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless **specifically** mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications.

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company.

Designation Signature

TECHNICAL SPECIFICATION

FOR

Three Phase, Four Wire

Class 0.5, -/5 Amp,

LT TRI-VECTOR

Smart Meter

Tata Power Company Ltd.

Meter management Department

Dharavi Receiving Station,

Matunga,

Mumbai – 400 019

Document No.	TPC\MTL\LTCT\2019\03	Issue No.	01
		Issue Date	25.09.2019
Revision No.	03	Revision Date	28.02.2024
Description	Prepared By & Date	Reviewed By & Date	Approved By & Date
SPECIFICATION FOR SINGLE PHASE SMART DLMS METER	Himali Patel	Rajesh Rajgurav & Devanjan Dey	S V Savarkar

Revision Summary

Revision No.	Revision Details	Revision Date	Reviewed & Approved By
01	Clause No. 4.31, 4.32, 13.5, 13.8 is modified to include common BCS compatibility, various program feature.	15.10.2020	N Manjunath J S Wadhwa
02	Modified/ Added current rating, DIP(Demand Integration Period) and SIP(Survey Integration Period), Latest IS no., Power consumption limit, Change of display sequence through firmware, Additional display sequence for Net meter, self diagnostics list for LCD segment check, RTC limit, RTC sync, KVAH logic availability in BCS, NIC with 4G LTE with fallback to 2G, NIC module design and integration removed from meter specs, Magnetic tamper, ESD tamper, ND tamper, Nomenclature for events, compartment size, optical port with metallic, encapsulated design of meter body, TPC hologram seal to vendor, Meter category in nameplate, pre dispatch inspection, meter guarantee as 60 months, CAPA of defective meter, latent defect.	10.06.2022	Devanjan Dey S V Savarkar
03	Updated Communication module with NBIOT added, metallic optical port added, display sequence modified, meter guarantee modified as 120 months and loading factor is added for meter guarantee, defective meter CAPA format is added, GPS tracking system, NIC card module position, Min and max instantaneous value in LS added.	05.06.2023	Rajesh Rajgurav & S V Savarkar
04	Modified Meter guarantee as 60 months from 120 months, Load survey days as 35 days, Midnight energies as 35 days. Requirement of GPS tracking is removed.	28.02.2023	Rahul Ranadive/Devanjan Dey & S V Savarkar

Contents

1 Scope:

This specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing, forwarding, supply and unloading at store/site of Three phase four Wire, 3*240 V, -/5A current operated ac static meters of accuracy class 0.5S and a two way communication with Head End System(HES) (here after referred as meters) complete with all accessories for efficient and trouble free operation.

2 Applicable Standards:

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

a) IS 16444 Part-2 2017) : A.C. Static Transformer operated WH and VARH meters, class 0.2s, 0.5s & 1.0S.
b) IS 14697 (2021) :A.C. Static Transformer operated Watt hour and VAR-hour meters meter class 0.2S, 0.5S, & 1.0S
c) IS 15959(Part 3-2017) : Data exchange for electricity meter reading , tariff and load control
d) IEEE 802.15.4(2003) : Standard for local and metropolitan area networks
e) IS 9000 : Basic Environmental testing procedure for electrical and electronic items.
f) IS 12346 (1999) : Specification for testing equipment for A.C.Electrical energy meter.
g) IS11000 (1984) : Fire hazard testing
h) IEC 62052-11 *(2003)* :Electricity Requirements (AC) General Requirements Tests and Test conditions for A.C.Static Watt hour meter for active energy Class 1.0 and 2.0.
i) IEC 62053-22 (2003) : Electricity metering equipment (a.c.) - Particular Requirements - Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)
j) IS 15707 (2006) : Testing Evaluation installation and maintenance of AC Electricity Meters-Code of practice.
k) IEC 60068 : Environmental testing.
l) CBIP – TR No.325 : Specification for A.C.Static Electrical Energy Meters (latest amendment).
m) CEA Regulation (2006) : Installation and operation of meters Dtd: 17/03/2006.
n) IS 60529 : Degree of protection provided by enclosure
o) IEC62056-61 : Electricity metering- Object Identification system (OBIS)

3 Climatic Conditions of The Installation:

a) Max. Ambient Temperature : 50deg.C
b) Max. Daily average ambient temp. : 40 deg.C
c) Min Ambient Temp : 0 deg C
d) Maximum Humidity : 95%
e) Minimum Humidity : 10%
f) Average No. of thunderstorm days per annum : 50
g) Maximum Annual Rainfall : 1450 mm
h) Average No. of rainy days per annum :60
i) Rainy months : June to Oct.
j) Altitude above MSL not exceeding : 300 meters
k) Wind Pressure : 150 kg/sq m

The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.3 g.

4 Technical Requirements:

S.No.	DESCRIPTION	Requirement
4.1	Type of the meter	Three phase Four wire , current operated static Watt-hour meter without application of any multiplication constant. It also Consists of measuring elements, TOU of register, Display and plug in type bi-directional communication module all integral within the meter housing. The meter design shall be such that no MF required for any parameter
4.2	Accuracy Class of the meter	0.5S
4.3	Basic Current (Ib) & rated Maximum current (Imax)	Ib= 5A; Imax= 10 Amps
4.4	Reference Conditions for testing the performance of the meter	Vref = 240 V $\pm$ 1 % Frequency = 50hz $\pm$ 0.3% Temperature= 27 C$\pm$ 2 0C (if the tests are made at the temperature other than reference temperature the results shall be corrected by applying Mean Temperature Coefficient 0.05)
4.5	Operating Voltage	Meter shall be operational with required accuracy from 0.6 Vref to 1.2 Vref. However meter shall withstand the maximum system Voltage of 440V (for minimum 5 min).
4.6	Operating Frequency	50 Hz$\pm$ 5%.
4.7	Power Consumption	Voltage circuit: Maximum 5W and 15 VA Current Circuit : Maximum 1VA (The additional power requirement during data transmission shall not exceed 7W as mentioned in IS 16444 whichever is lower, per communication module)
4.8	Starting Current	5mA (0.1% of Ib)
4.9	Short time over current	200 A for 0.05 sec (30Imax for one half cycle at rated frequency)
4.10	Influence of heating	Temperature rise at any point of the external surface of the meter shall not exceed by more than 20K with an ambient temperature at 45^0 C.
4.11	Rated Impulse withstand voltage	6KV (shall be applied ten times with one polarity and then repeated with the other polarity.)
4.12	AC withstand voltage for 1 min	4 KV
4.13	Insulation resistance Between frame & current ,voltage circuits connected together:	5 M ohm 50 M ohm.

	Between each current (or voltage circuit) & each and every other circuit. :	
4.14	Mechanical requirements	Meter shall be in compliance with clause 12.3 of IS 14697 and IS16444 part 2
4.15	Resistance to heat and fire	The terminal block and Meter case shall ensure safety against The spread of fire. They shall not be ignited by thermal Overload of live parts in contact with them as per clause 6.8 of IS 14697.Fire retardant material shall be used.
4.16	Protection against penetration of dust and water.	Degree of protection : IP 51 or better as per IS 12063/60529, but without suction in the meter. Meter shall comply with clause 6.9 and 12.5 of IS 14697. OEM who provides degree of protection higher than IP51 shall have first preference.
4.17	Resistance against Climatic influence.	Meter shall be in compliance with clause 2.6 of IS 14697.
4.18	Electromagnetic Compatibility (EMC)	Requirements shall be as per CBIP technical report no 325 (latest amendment)
4.19	Accuracy requirements	Meter shall be in compliance with clause 11 of IS 14697 & IS16444 part-2.
4.20	Power factor range	Zero lag to Zero lead.
4.21	Energy measurement	Fundamental energy +Energy due to Harmonics
4.22	Connection Diagram	The connection diagram for the system shall be provided on terminal cover.
4.23	Self-Diagnostic feature	The meter shall have indications for un satisfactory / non-functioning of (i) Real Time Clock and calendar (ii) RTC battery (iii) Non Volatile Memory (iv) LCD segment check (v) Communication Card
4.24	Initial startup of meter	Meter shall be fully functional within 5 sec after reference Voltage is applied to the meter terminals.
4.25	Alternate mode of supply to the meters	In case of power failure, reading/data shall be to downloaded with the help of battery of long life(minimum ten years) through Optical port in Battery mode.
4.26	Sleep Mode	Meter shall not go in sleep mode .Display should not be "OFF at any point of time when power up.
4.27	Internal diameter of the terminal holes Depth of the terminal holes	5 mm (minimum) 20 mm
4.28	Clearance between adjacent terminals	10 mm (minimum)
4.29	Display	Backlit LCD, Scrolling, 10 seconds for each parameter minimum 8 Digits LCD display. The back lit preferably in green color.

4.30	Security feature	Programmable facility to restrict the access to the information recorded at different security level such as read communication, write communication
4.31	Software and communication compatibility	The bidder shall supply software required for communication though local (CMRI and BCS software) and remote (AMI) connectivity free of cost and necessary training. For existing meter manufacturer, it should be ensured that all meters (existing non-smart & upcoming smart meters) can be read through one BCS only.
4.32	Calibration	Meters shall be software calibrated at factory and modifications in calibration shall not be possible at site by any means. However parameters like RTC, TOD slots & timings, DIP (billing & load survey), MD reset, billing date change, Set metering mode (Import/Export), display setting, shall be reconfigure through BCS/CMRI and remotely over the air (OTA), and any other support will be provided without any additional cost to TATA power till the useful life of the meters. Change in display setting shall be done through firmware upgrade by means of BCS/CMRI/Mobile app and remotely over the air (OTA). Meter data will not get reset while firmware upgrade or any programming. Display sequence for Net meter is given in the document.
4.33	Usage Application	Indoor and Outdoor
4.34	Ultrasonic welding	Meter cover and body should be Ultrasonic/chemical welded. Opaque design shall have first preference.
4.35	Meter Dimension in MM	Is not more than 250L*200W*100H
4.36	Real Time clock	Accuracy of RTC Should be as per CBIP-325 report and shall not vary by ± 5 min per year. Meter RTC shall be corrected automatically by the system in synchronization to the network RTC. Meter shall support RTC sync request from HES also.
4.37	KVAH & KVA calculation	Meter shall be programed as Lag+ Lead configuration i.e. Leading PF shall not be considered as unity. The same shall be displayed in BCS.
4.38	NO display	Meter Should design such a way, if meter found no display then after meter data retrieved from optical port.
4.39	Communication module of meter for AMI	As per clause no 1.2 (b) of IS 16444. Meter should have provision of communication module compatible with both the variant mentioned in IS 16444 PART-1. The Communication Network Interface Card (NIC) shall be 4G LTE with fallback provision to 2G or NbIOT and support all the bands offered by TSP's in India. It should be plug-in type and field hot swappable with cellular technology NIC of all type of meters of same make.

		Support for upgrade to 5G should be there without replacing the meter. Meter should be able to provide required power supply to NIC card. There shall not be an interlock while removing NIC card module with opening meter terminal cover.
4.40	Communication Layer Protocol	Should be as per clause 9.3 of IS 16444
4.41	Key Management and Security Feature	Should be as per IS 15959
4.42	Harmonics recording	The meter should record the current and voltage THD. The meter should record harmonics up to min 20th harmonic. However harmonics recording upto 31st shall give first preference. Average THD of all phase for voltage THD and current THD. THD values shall have 30 minutes integration period in load survey. Accuracy of harmonics recording shall be as per meter accuracy class. The meter shall generate a flag/event log whenever the threshold (user configurable) of the 5% THD of the load current and voltage is breached
4.43	Meter Category	D3 - The same shall be displayed in BCS

5 Immunity against external influencing signals:

5.1 Magnetic Field:

Meter shall be immune to magnetic field such that it shall not affect the normal overall functionality.

Meter shall comply test of effect due to influence quantities as per latest CBIP amendments.

Meter shall show “Magnet” or appropriate icon under display sequence in the display during magnet event.

The effect on the meter due to magnetic induction of external origin as obtained by the method detailed below shall be determined.

5.1.1 The continuous (DC) "Stray" magnetic induction of 67 m T ± 5% shall be obtained at a distance of 5 mm from the surface of the pole of the electromagnet according to Appendix E of CBIP 325 document, energized with a DC current. The magnetic field shall be applied successively to all the surfaces of the meter. The value of the magneto motive force to be applied shall be generally 1000 ampere-turns. However, considering the non-linearity of magnetization of the core, the ampere-turn might require slight adjustment to achieve the desired output.

5.1.2 The continuous (DC) "abnormal" magnetic induction of 0.2 Tesla ± 5% shall be obtained at a distance of 5 mm from the surface of the pole of the electromagnet according to Appendix E of CBIP 325 document, energized with a DC current. The magnetic field shall be applied successively to all the surfaces of the meter. The value of the magneto motive force to be applied shall be generally

10000 ampere-turn. However, considering the non-linearity of the magnetization of the core, the ampere-turns might require slight adjustment to achieve the desired output.

In the event of logging of presence of abnormal magnetic induction with date & time the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325 document, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and Cos Ø = 1.

5.1.3 The alternating (a.c) "stray" magnetic induction of 0.5 mT ± 5% shall be obtained by placing the meter in the center of circular coil, 1 m in mean diameter, of square section of small radial thickness relative to the diameter, and having 400 ampere-turns.

5.1.4 The alternating (AC) "abnormal" magnetic induction of 10 milli Tesla shall be obtained by placing the meter at various orientations in the centre of a circular coil as specified in 6.1.2, but with 2800 ampere-turns produced by a current of the same frequency as that of the voltage applied to the meter and under the most unfavourable conditions of phase and direction.

In the event of logging of presence of abnormal magnetic induction with date & time the positive variation of error may be beyond the limit of 4% but not exceeding a value (e) as given in Note 3.2 under Table 17 of CBIP 325 document, corresponding to nominal registration of the meter at reference voltage, 100% maximum current and cos Ø=1.

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

Consumption during magnet tamper shall be recorded in defraud register also. Demand shall be recorded as per actual load only.

5.2 Electrostatic Discharge (ESD)

Meter along with NIC shall be immune up to 35 kV and shall record accurate energy as per IS-14697:2021. Meter shall log the event into memory as 'ESD' with date & time stamp for any ESD greater than 35 kV and shall show 'ESD' in the display and should log in suitable compartment (Abnormal Interference at BCS end).

The shielding around the meter shall be such that it does not get affected by high voltage, high and low energy impulse when comes in contact with meter from any side.
The meter should immune to high/ low frequency Jammer devices. Meter shall log event in its memory as jammer with date and time stamp along with snapshot.

5.3 Neutral Disturbance

The meter shall log in the memory as 'NEUTRAL DISTURBANCE' with date and time stamp and show 'ND' in the display for Frequency variation below 45 Hz and above 55 Hz with time delay of 1 min and for Pulsating DC and Chopped AC of any value with time delay of 1 min.

The meter shall not saturate on passage of direct current, which can cause the meter either to stop recording/ record inaccurately. DC injection shall be tested both in phase and neutral. Measurement by meter shall not get influenced by injection of DC signal/ DC pulse upto 330V and for any value beyond this, the meter shall log the event into memory as

'NEUTRAL DISTURBANCE' with date & time stamp and shall show 'ND '/ suitable information in the display after time delay of 1 min(occurrences and restoration time).

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

5.4 Abnormal and Tamper conditions:

The meter shall record forward energy under any abnormal conditions.
All the tamper events i.e. shall be logged in the memory of the meter with date and time stamp of occurrence and restoration along with instantaneous electrical parameter (3ph. Voltage, 3ph. Current, Neutral Current, kWh, kVarh (Lag), kVarh (Lead), kVAh Energies, 3Ph. PF).

Meter shall store cumulative count and cumulative durations all the tamper event which have logged by meter from the date of energization till life of meter.
Tamper count shall be incremented only on the occurrence of the any tamper event with date and time.

Stamp on FIFO basis. The event which is not restored should not be removed from its meter memory and FIFO should not applicable for unrestored event.
The cover open tamper detection should be through heavy duty, sturdy micro switch such that it should not Operate on vibration or impact during handling or testing.
The meter shall register correctly if supply neutral is not available at the meter neutral terminal. The meter shall work in absence of two incoming wires. It shall keep recording correctly in case of unbalance system voltage.
The meter shall keep working accurately irrespective of the phase sequence of the supply.

The meter shall be able to differentiate between actual CT reversals and condition arising out of unbalanced / unhealthy capacitor bank.
Meter shall have neutral CT for tamper identification and analysis.

The size of compartments should be such that all above event are accommodated in the assigned event compartment. i.e. if in case of voltage compartment assigned to 4 number of events then the minimum size of this compartment should be such that it should accommodate sum of all maximum number of events as per below table.

All Transactional/Programing related events to be logged in BCS/HES along with date/time stamping and instantaneous parameters.
Suitable nomenclature/icon shall be displayed on meter display for Magnet, HV ESD, Neutral Disturbance, Meter cover open related events.
There should be provision to provide separate transaction count for Transaction & Firmware upgrades on display, however, at BCS end cumulative programming count (Transaction + Firmware upgrades) should be provided.

Persistence time for occurrence and restoration for the events and compartment block size shall be as per table given below

Compartment size	
Voltage related events	100
Current related events	100
Power failure related events	30
Transaction related events	20
Other events	50
Non-rollover events	1

Sr. No.	**Tampers/ Failures**	**Phase wise**	**Compartment Size**	**Logic/ Condition other than standard**	**Persistence time**	
					Occ Time (min)	Rec Time (min)
1	Voltage Failure	YES	25	Occ: Voltage <192V: and current > 2% Ib. Res: Vph > 192V (Independent of current)	5	5
2	Voltage unbalance	YES	25	Occ : (Vmax-Vph)>10% Vn and Vphase : 192<Vphase< 216 Res : (Vmax-Vph)<=10% Vn and Vphase : 192<Vphase< 216	5	5
3	High Voltage	YES	25	Vph > 110% of Vref res : Vph < 110% of Vref	30	30
4	CT open	YES	25	Occ: Iph < 1%Ib, >5% Ib in any of the other two phases (Ex: if Rph <1% of Ib, Y or B should be > 5% Ib) Res: Iph > 1% Ib in tampered phase	30	30
5	Current unbalance	YES	25	Occ : Imax – Imin > 30% of Iavg and Res : Imax – Imin < 30% of Iavg	15	15

6	CT Bypass	YES	25	Occ: CT bypass >20% Ib and all Iph < 1%Ib and no current reversal in any phase Res: CT bypass <20% Ib	30	30
7	Current reversal	YES	25	**Occ:** 1. KW ph negative and (Net KW > 1% of Vref*Ib) **OR** 2. KW > 5% of Vref*Ib and PF > 0.2 **Res :** 1. KW ph positive or (Net KW < 1% of Vref*Ib) **AND** 2. KW < 5% of Vref*Ib or PF < 0.2	2	2
8	Magnet	NO	25	Whenever meter sense magnetic field it shall record Active and Apparent energy at Imax at UPF	Immediate	Immediate
9	Neutral Disturbance	NO	25	Occ: Vph > 150% Vref OR In case of external signal injection (Chopped DC, Chopped AC and DC injection through diode) Res: On removal of spurious signal injection in neutral of meter.	5	5
10	ESD/JAMMER / Abnormal Interference	NO	25	Occ: Application of ESD and Jammer device Res: Removal of ESD and Jammer Device	2	2
11	Low PF Tamper	YES	25	**Occ:** 1. KW ph negative and (Net KW < 1% of Vref*Ib) **AND** 2. KW < 5% of Vref*Ib or PF < 0.2 **Res :** 1. KW ph positive or (Net KW > 1% of Vref*Ib) **OR** 2. KW > 5% of Vref*Ib and PF > 0.2	5	5
12	Top Cover open	NO	1	When cover opens by more than 2 to 4 mm.	Immediate	NA
13	Invalid Phase Association	YES	5	IF invalid phase association	5	5
14	NIC card Removed	NO	25	OCC: On removal of card	Immediate	Immediate

	(Immediate)			RES: On Inserction card		
15	Power On/Off	NO	25	Occ: Actual voltage OFF Res: Actual voltage ON	5	5
16.	Temperature Rise	NO	25	Occ: T > 70˚C REC: T < 60˚C	2	2

Note:-

1) During Voltage Failure event, The meter shall record energy proportional to the actual current, V Ref (240V) and UPF. Smart PT feature can be seen in BCS for verification.
2) In case of Invalid phase association, appropriate indication on meter display and BCS end shall be available.
3) If any change in tamper logic is required, TPC shall inform to successful bidder during PO placement or before starting of manufacturing as per requirement. Successful bidder shall make necessary changes according to TPC requirement.

6 General Technical Requirements

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

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

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components.
There should not be any connector or joint in CT secondary connection and shall be soldered directly on PCB.
The battery cell shall be button/coin type leak proof.

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

S No	Component Function	Requirement	Makes and Origin
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	USA: Anolog Devices, Cyrus Logic, Atmel, Phillips, freescale,NXP South Africa: SAMES Japan: NEC Singapore: Texas
2.	Memory chips	The memory chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Phillips, Onsemi Japan: Hitachi or Oki Europe: SGS Thomson
3.	Display modules	The display modules should be well protected from the external UV radiations. The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	Taiwan: Holtek Singapore: Bonafied Technologies Korea: Advantek China:Xiamen/ Tianma
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	USA: National Semiconductors Holland / Korea: Phillips Taiwan: MAXIM Japan:Hitachi, Everlight
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm	A class vendor
6.	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA: National Semiconductors, Atmel, Phillips, Texas Instruments, Rohm,Micron

			Japan:Hitachi, Oki, AVX or Ricoh Korea: Samsung
7.	Battery	Lithium with guaranteed life of 15 years	Varta / Tedirun /Sanyo / EVE / XENO, Mitsubishi or equivalent.
8.	RTC/Microcontroller	The accuracy of RTC shall be as per relevant IEC / IS standards	USA: Philips , Dallas, Atmel, Motorola Japan: NEC or Oki

Note: The makes of the components are in the preferential order.
Vendor shall submit list of components with makes to TPC during sample meter evaluation and FAT.

7 Meter Body:

Meter body shall be made of unbreakable, high grade, fire retardant reinforced Insulating material (protective Class II)with FVo or better Fire Retardant, self-extinguishing, UV stabilize, recyclable and Anti oxidation properties. The minimum thickness of the meter enclosure shall be 2mm.Meter base shall be opaque with polycarbonate LEXAN 500R or better on prior approval from the Purchaser. Meter cover shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the Purchaser. Meter cover & base shall be provided with continuous and seamless Ultrasonic/chemical welding such that it is not opened without breaking the enclosure. Front cover & base shall be such that it is not possible to cut & open the meter without certainly damaging the meter body and by no means shall an attempt to reassemble would not leave physical evidence. The damage evidences should be visible externally& should be traceable in such a way that attempts can be proved in court of law. The meter body shall be sealed in such a way that opening of meter base and cover is possible only after breaking the seal(s). Unidirectional screws to be used on meter covers where ever required. However meter with opaque encapsulated design/integrated base and cover (single enclosure) would be highly preferred, thus nullifying the possibility of opening of meter case. The meter body shall be such that the liquid or chemical shall not reach the electronic part PCB, processor and display from meter terminal and push button. Optical port of meter shall be metallic to hold magnetic optical cord during data downloading locally.

8 Terminals, Terminal Block

Terminal block should be in single mould with meter body base(Not separate). After any attempts the terminal block should not be able to disengaged, opened or loosen from any side. Any attempt to disengage the terminal block should certainly damage the meter body with physical evidences. The damage evidences should be visible externally& should be traceable in such a way that attempts can be proved in court of law
Terminals may be grouped in terminal block having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block adequate testing of materials shall be taken into account.

Terminal block and terminal cover shall be of a material which complies with the requirements of IS11731 (part 1) method FH1. The material of which the terminal block is made shall be capable of passing the test given in ISO 75 for temperature of 135°C and pressure of 1.8 M Pa. The terminal block shall be of opaque with polycarbonate LEXAN500Ror equivalent on prior approval from the Purchaser
The terminals shall be marked properly on the terminal block for making external connections.
The terminals and connections shall be suitable to carry up to 120 % of Imax continuously (Imax 6 A).
The terminal block, the terminal cover and the meter case shall ensure reasonable safety against the spread of fire. They shall not be ignited by thermal overload of live parts in contact with them.
The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Terminals shall be preferably of MS cage clamp type as per IS: 15707or of flat end screw with at least 9 mm dia of screw for better contact area.
The preferred arrangement of terminals shall be linear. Internal diameter of the terminal holes shall be minimum 5 mm; minimum clearance between adjacent terminals shall be 10 mm. Depth of the terminal holes shall be of 25 mm. Terminal screws shall be of Zinc plated MS bottle type. Minimum two number of terminal screw to be provide per terminal wires.
Meter terminal should have 11pin arrangement consisting of neutral and neutral S2 shorted inside the meter. All terminal should be in one row only.
Terminal block shall be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.
The preferred arrangement of terminals shall be linear. Minimum two number of terminal screws to be provided per terminal wire

8.1 Terminal Cover:

Terminal cover shall be of short type and shall be transparent with polycarbonate LEXAN 143R/943A or equivalent on prior approval from the Purchaser. Appropriate space shall be available for incoming /outgoing cables without damaging/stressing terminal cover (terminal cover design shall be as per the Purchaser approval). After sealing the cover, terminals shall not be accessible without breaking the seals. Terminal Cover with C cut to enable smooth insertion of cable in the terminals.
The terminal cover shall be 50 mm length from bottom of terminal block in line with meter base.
The terminal cover should open on the top side, during connection of the cables. The side opening of terminal cover is not acceptable due to additional opening space requirement

8.2 Sealing of meter

Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons. For this, one number Polycarbonate seal left side and one number Hologram seal on right side shall be provided by the Bidder.

Additional Hologram seals will be provided by TPC to supplier for putting them on meter body as per requirement at Factory. Reconciliation of seals shall be provided by bidder after its usage.

All the seals shall be fixed on meter body by the bidder at his works before dispatch
Two sealing provision shall be provided at meter terminal cover, such that terminal shall not be accessible without breaking the seals. All the seals shall be provided on front side only and as per the Purchaser specification. Rear side sealing arrangement shall not be accepted. Bidder shall provide seals be as per CEA regulation (2006). Only patented seals to be used as per CEA requirements.

Plug in type NIC card cover should have proper sealing arrangement and should be sealed with manufacturer's polycarbonate seal.

The bidder shall provide the soft record of polycarbonate seal, Manufacturers and TPC hologram seal serial number, NIC card serial number and box packing list used against each meter serial number along with its position in tabular form for every lot of meter.

9 TOD Feature:

The meter shall be capable of measuring Cumulative Energy (KWh), Kvah and MD (KW, KVA)with time of day (TOD) registers having 5 zones (no. of zones & time slot shall be programmable by BCS,CMRI, Mobile App, OTA with adequate security level).
TOD Slot Configuration shall be as follows-

Slot	Time Slots
TOD 1	22 to 06 Hrs
TOD 2	06 to 09 Hrs
TOD 3	09 to 12 Hrs
TOD 4	12 to 18 Hrs.
TOD 5	18 to 22 Hrs

10 MD Integration:

The MD integration period shall be 15 minutes (integration period-programmable by CMRI at site and also thru AMR with adequate security level). The MD resetting shall be automatic at the 1st of the month i.e. 0000 hours of 1st day of the month. Manual MD reset button functionality shall not be available. Last 12 MD values shall be stored in the memory. MD shall be recorded and displayed with minimum three digits before decimal and minimum three digits after decimal points. MD integration shall be Block Type Demand.

11 Parameters In BCS

All these parameters shall be downloaded locally or remotely. All the parameters shall be recorded in its NVM(Non Volatile Memory). NVM shall have minimum retention time of 10 Years. Below mention current, history billing data and at least 25 tamper event for each tamper shall be available In NVM.
NVM OK/Fail status or flag shall be made available at BCS end for better data analysis.
Preference shall be given to bidder who provides CAIDI profile, Max outage duration, time of max outage & its histories at BCS end.

11.1 Billing Information

Current+ 12 Month History billing Date

Current + 12 Month History of Energy (KWH, KVAH, KVARH Lag, KVARH Led, Def KWH, Def KVAH)
Current + 12 Month History Consumption (KWH, KVAH, KVARH Lag, KVARH Led, Def KWH, Def KVAH)
Current + 12 Month History of Demand (KW,KVA, KVAR Lag, KVAR led) Along with date and time stamp
Current + 12 Month History of PF

11.2 TOD wise billing Information

Current + 12 Month History of Energy (KWH, KVAH)
Current + 12 Month History of Consumption (KWH, KVAH)
Current + 12 Month History of Demand (KW, KVA) along with date and time stamp
Current + 12 Month History of PF

11.3 Load survey:

The meter shall be capable of recording load profile of atleast 35 days for 15 min IP for ON days only for following parameters.

a. KWH
b. KVAH
c. KVARH Lag
d. KVARH Led
e. KW
f. KVA
g. KVAR Lag
h. KVAR Led
i. Phase wise PF
j. Voltage for each Phase
k. Current for each Phase
l. Neutral current
m. THD Voltage phase wise
n. THD Current phase wise
o. Temperature

Note: In addition to Billing Load Survey Profile, additional logger profile should be configurable for Instantaneous Parameters for 5/15/30 Min.
Instantaneous parameters (from point no. j to n) can be configured for minimum/ maximum/ average for the configured integration period.

11.4 MID Night Energy:

Meter shall be capable of recording daily Midnight Energy(KWH, KVAH) 00:00 to 24:00 Hrs for min. 35 power ON days.

11.5 Instantaneous Parameters:

Meter shall have capable following Instantaneous parameter In Memory and should be available in BCS
Meter Serial No
Meter Type

Meter date and Time
MRI date and time
Dump date and time
Voltage of each Phase
Line Current of each Phase
Active Current of each Phase
Reactive Current of each Phase
Actual Neutral current
Power factor of each Phase
Average Power Factor
Instantaneous Frequency
Instantaneous Load (KW, KVA, KVAR Lag, KVAR Led)
Present Cumulative energy(KWH, KVAH, KVARH Lag, KVARH Led, Def KWH, Def KVAH)
Cumulative Tamper count
Cumulative Billing Count
Cumulative Programming Count
Vector/Phasor diagram
THD current (Phase wise & average)
THD voltage (Phase wise & average)
THD power(Phase wise & average)
Separate Event count (voltage unbalance, overcurrent, CT open/By pass,low voltage etc.)

11.6 General Information:-

Meter shall be capable for providing below mention general parameters in memory should be available in BCS
Meter serial No
Meter Type
Manufacture Name
Manufacture date
Meter Class
Meter constant
Meter voltage rating
Meter current rating
Firmware version of meter
Available TOD profile showing timing and seasons
Available Meter display sequence

11.7 Transactions:-

All energy & demand parameters alongwith date time stamping shall be available with status of Relay connect/disconnect.

12 Display units:

The display unit shall be Pin type built-in liquid crystal display (Permanently backlit type LCD). The LCD shall be of STN (Super Twisted Nematic) construction suitable for maximum temperature withstands 65 C degree and minimum temperature withstands 0degree C during normal operating condition. The LCD display shall have a wide viewing angle of 120

degree. When the meter is not energized the electronic display need not be visible. The display shall not be affected by electrical, magnetic disturbances and ESD. The back lit must be green in color while in normal registration modes.

Display shall have minimum 6 digits before decimal for energy register, 3 digits before & 3 digits after decimal place in the display for demand register, 2 digits before & 4 digits after decimal place in the display for High resolution energy registers, 3 digits before decimal & 3 digit after decimal for Voltage, 3 digits before decimal & 3 digit after decimal for Current, 1 digits before decimal & 3 digit after decimal for PF, 3 digits before decimal & 3 digit after decimal for Power, size of the digits shall be minimum 10mmx6mm. Cumulative energy (KWh) shall be displayed without decimal in auto scroll mode.

Persistence time for each parameter shall be 10 second. Values followed by header shall be avoided. (I.e. if MD1 is displayed in Auto scroll mode, Header (MD1) and value (say 5.23 KW) shall be shown simultaneously; it shall not be shown in successive displays. Off time shall not be available in auto scroll mode between each cycle. Auto scroll mode is restored after 30 sec, if push button is not operated.

1. **Default Display sequence –**

Display1 Parameters (Auto Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Cumulative Forward kWh (7+1)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Average PF
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh
Latest reset-TOD 2 Forward kWh

Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time
Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Latest reset- Average PF

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Phase wise Voltage
Instantaneous Phase wise Current
Instantaneous Neutral Current
Instantaneous Active power
Instantaneous Reactive power
Instantaneous Apparent power
Instantaneous Phase wise PF
Cumulative Forward kWh (7+1)
TOD 1 Forward kWh
TOD 2 Forward kWh
TOD 3 Forward kWh
TOD 4 Forward kWh
TOD 5 Forward kWh
Cumulative Forward kVArh lag
Tariff wise MD Forward kVA Date & time
Cumulative Forward kVArh lead
Cumulative Forward kVAh
TOD 1 Forward kVAh
TOD 2 Forward kVAh
TOD 3 Forward kVAh
TOD 4 Forward kVAh
TOD 5 Forward kVAh
Average PF
Latest reset- Forward kWh
Latest reset-TOD 1 Forward kWh

Latest reset-TOD 2 Forward kWh
Latest reset-TOD 3 Forward kWh
Latest reset-TOD 4 Forward kWh
Latest reset-TOD 5 Forward kWh
Latest reset- Forward kVArh lag
Latest reset-Tariff wise MD Forward kVA Date & time
Latest reset- Forward kVArh lead
Latest reset- Forward kVAh
Latest reset-TOD 1 Forward kVAh
Latest reset-TOD 2 Forward kVAh
Latest reset-TOD 3 Forward kVAh
Latest reset-TOD 4 Forward kVAh
Latest reset-TOD 5 Forward kVAh
Latest reset- Average PF
Rising Demand Forwared kVA
Connection Check
Voltage Phase sequence
Current Phase sequence
Previous reset- Forward kWh
Previous reset- Tariff wise Forward kWh
Previous reset - Forward Kvarh Lag
Previous reset- Tariff wise MD forward KVA Date & Time
Previous reset- Forward Kvarh Lead
Previous reset - Forward Kvah
Previous reset - Tariff wise Forward Kvah
Previous reset - Average PF
MD reset count
Defrauded Energy cummulative Kwh
Defrauded Energy cummulative Kvah
Cummulative Tamper count
History of last 3 tampers
Defraud Register Cumulative kWh during Magnetic Tamper (6+2)
Defraud Register Cumulative kWh during ND Tamper (6+2)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest ND tamper occurrence Date & time
Latest ND tamper recovery Date & time
Cover Open tamper occurrence Date & time
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status

RSSI Value
Error Code- Meter and NIC health indicator

Display3 Parameters (High Resiolution Mode)
Cumulative Forward kWh (2+5)
Cumulative Forward kVArh lag (2+5)
Cumulative Forward kVArh lead (2+5)
Cumulative Forward kVAh (2+5)
Battery mode will be as per display 1, 2 and 3 sequentially.

Meter shall be unidirectional by default unless specified. However it can be programmed through BCS, HHU, Mobile App and OTA.

2. **Display sequence for Net meter (programmable through firmware upgrade) –**

Display1 Parameters (Auto Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Cumulative kWh (7+1) - Import
TOD 1 kWh - Import
TOD 2 kWh - Import
TOD 3 kWh - Import
TOD 4 kWh - Import
TOD 5 kWh - Import
Cumulative kVArh lag - Import
Tariff wise MD kVA Date & time - Import
Cumulative kVArh lead - Import
Cumulative kVAh - Import
TOD 1 kVAh - Import
TOD 2 kVAh - Import
TOD 3 kVAh - Import
TOD 4 kVAh - Import
TOD 5 kVAh - Import
Cumulative kWh (7+1) - Export
TOD 1 kWh - Export
TOD 2 kWh - Export
TOD 3 kWh - Export
TOD 4 kWh - Export
TOD 5 kWh - Export
Cumulative kVArh lag - Export
Tariff wise MD kVA Date & time - Export
Cumulative kVArh lead - Export
Cumulative kVAh - Export

TOD 1 kVAh - Export
TOD 2 kVAh - Export
TOD 3 kVAh - Export
TOD 4 kVAh - Export
TOD 5 kVAh - Export
Average PF
KVA Rising demand

Display2 Parameters (Manual Scroll Mode)
Display Check
Meter Serial Number
RTC- Date (DD.MM.YY)
RTC- Time (HH:MM:SS)
Instantaneous Phase wise Voltage
Instantaneous Phase wise Current
Instantaneous Neutral Current
Instantaneous Active power
Instantaneous Reactive power
Instantaneous Apparent power
Instantaneous Phase wise PF
Net Average PF
Rising Demand Forwared kVA
Latest reset- Cumulative kWh (7+1) - Import
Latest reset- TOD 1 kWh - Import
Latest reset- TOD 2 kWh - Import
Latest reset- TOD 3 kWh - Import
Latest reset- TOD 4 kWh - Import
Latest reset- TOD 5 kWh - Import
Latest reset- Cumulative kVArh lag - Import
Latest reset- Tariff wise MD kVA Date & time - Import
Latest reset- Cumulative kVArh lead - Import
Latest reset- Cumulative kVAh - Import
Latest reset- TOD 1 kVAh - Import
Latest reset- TOD 2 kVAh - Import
Latest reset- TOD 3 kVAh - Import
Latest reset- TOD 4 kVAh - Import
Latest reset- TOD 5 kVAh - Import
Latest reset- Cumulative kWh (7+1) - Export
Latest reset- TOD 1 kWh - Export
Latest reset- TOD 2 kWh - Export
Latest reset- TOD 3 kWh - Export
Latest reset- TOD 4 kWh - Export
Latest reset- TOD 5 kWh - Export
Latest reset- Cumulative kVArh lag - Export
Latest reset- Tariff wise MD kVA Date & time - Export

Latest reset- Cumulative kVArh lead - Export
Latest reset- Cumulative kVAh - Export
Latest reset- TOD 1 kVAh - Export
Latest reset- TOD 2 kVAh - Export
Latest reset- TOD 3 kVAh - Export
Latest reset- TOD 4 kVAh - Export
Latest reset- TOD 5 kVAh - Export
Latest reset Average PF
Previous reset- Cumulative kWh (7+1) - Import
Previous reset- TOD 1 kWh - Import
Previous reset- TOD 2 kWh - Import
Previous reset- TOD 3 kWh - Import
Previous reset- TOD 4 kWh - Import
Previous reset- TOD 5 kWh - Import
Previous reset- Cumulative kVArh lag - Import
Previous reset- Tariff wise MD kVA Date & time - Import
Previous reset- Cumulative kVArh lead - Import
Previous reset- Cumulative kVAh - Import
Previous reset- TOD 1 kVAh - Import
Previous reset- TOD 2 kVAh - Import
Previous reset- TOD 3 kVAh - Import
Previous reset- TOD 4 kVAh - Import
Previous reset- TOD 5 kVAh - Import
Previous reset- Cumulative kWh (7+1) - Export
Previous reset- TOD 1 kWh - Export
Previous reset- TOD 2 kWh - Export
Previous reset- TOD 3 kWh - Export
Previous reset- TOD 4 kWh - Export
Previous reset- TOD 5 kWh - Export
Previous reset- Cumulative kVArh lag - Export
Previous reset- Tariff wise MD kVA Date & time - Export
Previous reset- Cumulative kVArh lead - Export
Previous reset- Cumulative kVAh - Export
Previous reset- TOD 1 kVAh - Export
Previous reset- TOD 2 kVAh - Export
Previous reset- TOD 3 kVAh - Export
Previous reset- TOD 4 kVAh - Export
Previous reset- TOD 5 kVAh - Export
Previous reset Average PF
Connection Check
Voltage Phase sequence
Current Phase sequence
MD reset count
Defrauded Energy cummulative Kwh
Defrauded Energy cummulative Kvah

Cummulative Tamper count
History of last 3 tampers
Defraud Register Cumulative kWh during Magnetic Tamper (6+2)
Defraud Register Cumulative kWh during ND Tamper (6+2)
Latest Magnetic tamper occurrence date & time
Latest Magnetic tamper recovery date & time
Latest ND tamper occurrence Date & time
Latest ND tamper recovery Date & time
Cover Open tamper occurrence Date & time
Meter Version
DLMS Version
RTC Date Status
Battery Status
Non volatile memory status
NIC card status
Error Code- Meter and NIC health indicator

Display3 Parameters (High Resiolution Mode)
Cumulative Forward kWh (2+5) - Import
Cumulative Forward kVArh lag (2+5) - Import
Cumulative Forward kVArh lead (2+5) - Import
Cumulative Forward kVAh (2+5) - Import
Cumulative Forward kWh (2+5) - Export
Cumulative Forward kVArh lag (2+5) - Export
Cumulative Forward kVArh lead (2+5) - Export
Cumulative Forward kVAh (2+5) - Export

Battery mode will be as per display 1,2 and 3 sequentially.

For Net meter mode, Both Import and export energy recording shall be applicable in this mode of metering and relevant registers like Billing, LS, tamper logics etc shall be updated and shall be available in BCS also

Note: Latest reset is History 1 & Previous reset is History 2

All these parameters shall be downloaded locally or remotely and interpreted in PC/Laptop.

All the parameters shall be recorded and memorized in its Non-Volatile Memory (NVM). The corresponding non-volatile memory shall have a minimum retention time of 10 years.

Error code – Meter and NIC health indicator shall be displayed as following or any better provision-

SR No.	Error Code to be Displayed	Description

1	Err 00	All Good
2	Err 01	Meter NIC Communication failure
3	Err 02	Modem Initialization Failure
4	Err 03	SIM Not Detected
5	Err 04	SIM Invalid
6	Err 05	No GSM Network Coverage
7	Err 06	GPRS Network Registration failure
8	Err 07	GPRS Registration Denied
9	Err 08	No APN Configured
10	Err 09	GPRS Connection Not Established
11	Err 10	HES IP/Port not configured
12	Err 11	HES Port Not Open
13	Err 12	Any key Mismatch Between Meter and NIC

13 Output Device:

13.1 Pulse rate

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

Meter constant shall be as actual without multiplying factor.

13.2 Communication LCD indicator

The meter shall be provided with suitable LCD/LED indication for communication in progress.
Meter shall display Communication status indications on LCD/LED without affecting normal display parameters.

14 Name plate and Marking:

Meters shall have a name plate clearly visible and effectively secured against removal. The name plate data should be laser printed. No sticker to be used to avoid loss of data in event of fire. The base color of Name plate shall be white indelibly and distinctly marked with all essential particulars as per relevant standards along with the following. The Serial no. series applicable for the meters shall be provided by Tata Power.

i.Manufacturer's name

ii. Type designation
iii. Number of phases and wires
iv. Serial number (Meter serial number shall be laser printed on name plate instead on sticker).
v. Serial number along with barcode
vi. Month and Year of manufacture
vii. Unit of measurement
viii. Reference voltage ,frequency
ix. Ref. temperature
x. Rated basic and maximum Current
xi. Meter constant (imp/kWh)
xii. 'BIS' Mark
xiii. Class index of meter
xiv. "Property of Tata Power Co. Ltd
xv. Purchase Order No. & date
xvi. Guarantee period.
xvii. Sign of double square
xviii. Country of manufacture.
xix. Firmware version of meter
xx. Meter category
xxi. NIC serial NO (Shall be visible from Communication Module Slot) along with barcode/ QR code
xxii. Compatibility of NIC Card.

Bidder should ensure that NIC provided in meters are having Sr. No., MFG date, Property of TATA POWER' marked, PO date and no. (same as that of meter PO)

15 Tests:

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

15.1 Routine Test

i. AC High Voltage test
ii. Insulation test
iii. Test on limits of error
iv. Test of starting current
v. Test of no load condition

15.2 Acceptance test:

i. AC High Voltage test
ii. Insulation test
iii. Test on limits of error as per IS load points

iv. Test of meter constant
v. Test of starting current
vi. Test of no load condition
vii. Test of repeatability of error.
viii. Test of power consumption.
ix. Test for Immunity against external influencing signal as per the Purchaser specification
x. Test for Immunity against DC Immunity as per the Purchaser specification
xi. Test for Immunity against Tamper conditions as per the Purchaser specification
xii. Error measurements with abnormal condition
xiii. Test to Influence of Harmonics
xiv. Supply voltage and frequency variation test
xv. Testing of self-diagnostic features
xvi. All tamper test, count increment and logging with date and time
xvii. All tests as defined in IS 15959(Part-3)
xviii. Functionality of communication module is 16444 part2
xix. smart meter communicability as per provision of 28 IS 15959 (part-3)
xx. Physical check of NIC and replaceable ease of the NIC module in meter

15.3 Type test:

i. All tests as defined in IS 14697:2021 with Latest editions.
ii. Test against abnormal magnetic influence as per CBIP TR 325 with Latest editions.
iii. DC immunity test (injection both on phase and neutral terminal)
iv. Test for Material used for Terminal Block and meter body as per relevant standards with Latest editions.
v. IP Test with Latest editions.
vi. Smart meter communicability as per 15959 part-3
vii. Meter shall be type tested as per BIS16444 part-2

Note:- Bidder must mention IS 13779:1999 with latest edition in factory test report.

15.4 Special test:

i. The bidder shall demonstrate the communication capability of the meter through communication modes as defined in the specification before conducting acceptance tests. The bidder shall ensure that API (Application protocol interface) is compatible with TPC.
ii. Temperature rise of terminal block at 120% of Imax for 6 Hours

16 Type Tests Certificates:

The bidder shall furnish the type test certificates of the meter for the tests as mentioned above as per the corresponding standards. All the tests shall be conducted at CPRI / ERDA/ any NABL accredited lab as per the relevant standards. Type test should have been conducted in certified Test Laboratories during the period not exceeding 5 years from the date of opening the bid. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPC.

17 Pre-Dispatch Inspection:

The successful bidder shall submit two prototype samples for further testing and compliance as per specifications and getting approval before mass manufacturing. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Equipment shall be subject to inspection by a duly authorized representative of the Purchaser. Bidder shall grant free access to the places of manufacture to TPC's representatives at all times when the work is in progress. Inspection by the TPC or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific DC (Dispatch Clearance) is issued by TPC.

Following documents shall be sent along with material

a) Test reports
b) MDCC issued by TPC
c) Invoice in duplicate
d) Packing list
e) Drawings & catalogue
f) Guarantee / Warrantee card
g) Delivery Challan
h) Other Documents (as applicable)
i) Compatible BCS software
j) Meter user manual covering Technical Parameters, display, tamper logics, meter dimensions, etc

18 INSPECTION After Receipt At Store:

The material received at Purchaser's store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection. The successful bidder shall submit two extra boxes (unpaid) per lot delivered (lot size shall be 2,000 numbers or as defined in the order)

19 Guarantee:

Bidder shall stand guarantee towards design, materials, workmanship & quality of process / manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the purchaser up to a period of at least **60** months from the date of last supplies, Bidder shall be liable to undertake to replace/rectify such defects at its own costs, within mutually agreed time frame not more than 1 month, and to the entire satisfaction of Tata Power, failing which Tata Power will be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the " Security cum Performance Deposit" as the case may be.

Bidder shall own responsibility for all internal component with an end to end agreement with individual component manufacturer.

Bidder to collect all defective meters from stores for repairs as per defined timeframe and send those meters immediately after repairs.

Bidders to submit CAPA report of each defective meter and submit the same to Lab/Store representative along with dispatch of repaired meters.

Format of CAPA report-

S. No	Type	Meter No	Defects from Tata Power	Observations at OEM	Root-Cause by OEM	Corrective Actions taken by OEM	Preventive Actions taken by OEM

Meters to be designed in such a way that cases of No display/ Display faulty will be bare minimum or else Tata Power will liable to reject entire lot of meters.

Bidder shall further be responsible for 'free replacement/repairs" of entire lot of meters for any 'Latent Defects '(design issue due to faulty lot component) if noticed and reported by the purchaser within guarantee period.

Manufacture shall collect disputed meter from meter stores and provide testing report of disputed meter refer by TPC within 15 days period irrespective of guarantee period.

20 Packing:

Bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The material used for packing shall be environmentally friendly. Packing and transportation shall be as per IS 15707:206 clauses 9.1 and 9.2. Routine test report of the individual meter shall be kept inside each card board carton of the meter.

21 Tender Sample:

Bidders are required to manufacture 3 sample meters as per the TPC specification (sealed, unsealed and openable base and cover to view/test the inner circuits) and submit the sample (non-returnable) along with bid for approval.

Following accessories to be submitted along with sample

1. Test Reports of 3 sample meters (Type test, Acceptance test **)**
2. Detailed User Manual along with dimension
3. Guaranteed Technical Particulars
4. Tamper logic sheet
5. Display parameter sequence
6. BCS, MRI and Mobile App software for reading, programming
7. Optical communication cords
8. Internal connection diagram
9. List and make of all electronics component used

10. Clause by clause compliance sheet of Technical Specification
11. Bidder shall be responsible for integration of Meters with NIC and TPC HES.

22 QUALITY Control:

The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished.

Quality should be ensured at the following stages:

- At PCB manufacturing stage, each board shall be subjected to computerized bare board testing.
- At insertion stage, all components should undergo computerized testing for conforming to design parameter and orientation.
- Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipment (ATEs).
- Prior to final testing and calibration, sample meters shall be subjected to aging test (i.e. meters will beare kept in ovens for 24 hours at 55 Deg. C temperature and atmospheric humidity under real-life condition at its full load current. After 24 hours meter should work satisfactorily)

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

23 Minimum Testing Facilities:

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

24 Manufacturing activities:

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

25 Drawings:

Following drawings & Documents shall be prepared based on TPC specifications and statutory requirements and shall be submitted with the bid:

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

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

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

Bidder shall subsequently provide Four (4) complete sets of final drawings, one of which shall be auto positive suitable for reproduction, before the dispatch of the equipment. Soft copy (Compact Disk CD) of all the drawing, GTP, Test certificates shall be submitted after the final approval of the same to purchaser.
All the documents & drawings shall be in English language.
Instruction Manuals: Bidder shall furnish two softcopies (CD) and four (4) hard copies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

26 Guaranteed Technical Particulars:

S.No	**Description**	**Units**	**As Furnished by Bidder**
1	Type of meter		
2	Accuracy Class of the meter		
3	Ib & Imax	A	
4	Operating Voltage	V	
5	Operating Frequency	*Hz*	
6	Power Consumption and Burden		
7	Starting Current	mA	

8	Short time over current	A	
9	Influence of heating		
10	Rated impulse withstand voltage	KV	
11	AC withstand Voltage for 1 min	KV	
12	Insulation resistance a) Between frame &Current, voltage circuits connectedtogether: b) Between each current(or voltage circuit) & eachand every other circuit.	M ohm	
13	Mechanical requirement as per IS 14697 and IS 16444 part 2		
14	Resistance to heat and fire (As per specification)		
15	Degree of protection		
16	Resistance against climatic influence (as per IS 14697 and IS 16444 part-2)		
17	Electromagnetic Compatibility (EMC) as per CBIP Technical report no 88(latest amendment		
18	Accuracy requirements (As per IS 14697 and IS 16444 part-2		
19	Power factor range		
20	Energy measurement		
21	Connection Diagram for system on terminal cover	Yes/No	
22	Self diagnostic feature		
23	Initial start up of meter (meter shall be fully functional within 5 sec after reference voltage is applied to the meter terminals)		
24	Terminal block		

	a) Depth of the Terminal holes b) Internal diameter of terminal holes c) Clearance between adjacent terminals	mm mm mm	
25	Communication capabilities		
26	Immunity against abnormal Magnetic influence,		
27	Immunity against HV ESD		
28	DC Immunity as defined in		
29	Grade of material for a) Meter base b) Meter cover c) Terminal block d) Terminal cover		
30	Tamper counts		
31	Recording forward energy in all conditions as per IS 15959 part3	Yes/No	
32	Makes of all components used in the meter.	Yes/No	
33	Non Volatile memory (Retention period)		
34	Measuring elements used in the meter		
35	Power supply to circuit in case of supply failure		
36	Display of measured values (As per specification –clause 5.8)	Yes/No	

37	LCD display (Type and viewing angle)		
38	Pulse rate	Imp/kWh, Imp/kVArh	
39	Name plate marking	Yes/No	
40	Routine test certificates	Yes/No	
41	Acceptance test certificates	Yes/No	
42	Type test certificates	Yes/No	
43	Guarantee certificates	Yes/No	
45	Tamper thresholds	Yes/No	
46	Ultrasonic Welding of cover and Base	Yes/No	
47	Fire retardant category of meter Body And terminal block		
48	Supply of jig for retrieval of Damaged/ burnt meter.		
49	Meter shall be programed for like RTC, TOD		
50	Dimension of meters L*B*H		
51	KVAH & KVA calculation		
52	Meter data retrieved if meter found no display	Yes/No	
53	RJ 11 Pin configuration as per TPC	Yes/No	
54	Make of Disconnector Switch		
55	Output Device (LEDs) As per Cl 14		
56	NIC module with cover & sealing		

	Arrangement		
57	Harmonics Recording- The recordi of harmonics up to 20th harmonic Average THD of all phase for volta THD and current THD.		
58	Accuracy of harmonics recording		
59	Flag in BCS for high THD in any phase V or I		
60	Measuring element used		
61	Meter Category		
62	Calibration (programming)		
63	Usage application	Indoor/ Outdoor	
64	Ultrasonic welding/ Chemical welc		

Electronics parts

Sr NO	**Component Fundtion**	**Requirement**	**Makes and Origin (to be provide by Bidder)**
1.	Measurement/ computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs	
2.	Memory chips	The memory chips should not be affected by the external parameters	

		like sparking, high voltage spikes or electrostatic discharges.	
3.	Display modules	The display modules should be well protected from the external UV radiations The display visibility should be sufficient to read the meter mounted between height of 0.5m and 2m. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. (Pin Type) It should be trans-reflective STN type industrial grade with extended temperature range.	
4.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	
5	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm and Conformal coating required to protect from Environment like moisture	
6.	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	
7.	Battery	Lithium with guaranteed life of 15 years	
8.	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	

27 Schedules Of Deviations:

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the purchaser's specifications.

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Company.

Designation Signature

ANNEXURE III

Schedule of Deviations

Bidders are advised to refrain from taking any deviations on this TENDER. Still in case of any deviations, all such deviations from this tender document shall be set out by the Bidders, Clause by Clause in this schedule and submit the same as a part of the ***Technical Bid.***

Unless specifically mentioned in this schedule, the tender shall be deemed to confirm the TPC's specifications:

S. No.	Clause No.	Tender Clause Details	Details of deviation with justifications

By signing this document we hereby withdraw all the deviations whatsoever taken anywhere in this bid document and comply to all the terms and conditions, technical specifications, scope of work etc. as mentioned in the standard document except those as mentioned above.

Seal of the Bidder:

Signature:

Name:

RFQ No.: CC24VKD032

ANNEXURE IV

Schedule of Commercial Specifications

(The bidders shall mandatorily fill in this schedule and enclose it with the offer Part I: Technical Bid. In the absence of all these details, the offer may not be acceptable.)

S. No.	Particulars	Remarks
1.	Prices firm or subject to variation (If variable indicate the price variation clause with the ceiling if applicable)	Firm / Variable
1a.	If variable price variation on clause given	Yes / No
1b.	Ceiling	-------- %
1c.	Inclusive of Excise Duty	Yes / No (If Yes, indicate % rate)
1d.	Sales tax applicable at concessional rate	Yes / No (If Yes, indicate % rate)
1e.	Octroi payable extra	Yes / No (If Yes, indicate % rate)
1f.	Inclusive of transit insurance	Yes / No
2.	Delivery	Weeks / months
3.	Guarantee clause acceptable	Yes / No
4.	Terms of payment acceptable	Yes / No
5.	Performance Bank Guarantee acceptable	Yes / No
6.	Liquidated damages clause acceptable	Yes / No
7.	Validity (180 days) (From the date of opening of technical bid)	Yes / No
8.	Inspection during stage of manufacture	Yes / No
9.	Rebate for increased quantity	Yes / No (If Yes, indicate value)
10.	Change in price for reduced quantity	Yes / No (If Yes, indicate value)
11.	Covered under Small Scale and Ancillary Industrial Undertaking Act 1992	Yes / No (If Yes, indicate, SSI Reg'n No.)

ANNEXURE V

Checklist of all the documents to be submitted with the Bid

Bidder has to mandatorily fill in the checklist mentioned below:-

S. No.	Documents attached	Yes / No / Not Applicable
1	EMD of required value	
2	Tender Fee as mentioned in this RFQ	
3	Company profile/organ gram	
4	Signed copy of this RFQ as an unconditional acceptance	
5	Duly filled schedule of commercial specifications (Annexure IV)	
6	Sheet of commercial/technical deviation if any (Annexure III)	
7	Balance sheet for the last completed three financial years; mandatorily enclosing Profit & loss account statement	
8	Acknowledgement for Testing facilities if available (duly mentioned on bidder letter head)	
9	List of Machine/tools with updated calibration certificates if applicable	
10	Details of order copy (duly mentioned on bidder letter head)	
11	Order copies as a proof of quantity executed	
12	Details of Type Tests if applicable (duly mentioned on bidder letter head)	
13	All the relevant Type test certificates as per relevant IS/IEC (CPRI/ERDA/other certified agency) if applicable	
14	Project/supply Completion certificates	
15	Performance certificates	
16	Client Testimonial/Performance Certificates	
17	Credit rating/solvency certificate	
18	Undertaking regarding non blacklisting (On company letter head)	
19	List of trained/untrained Manpower	

ANNEXURE VI

Acceptance Form for Participation In Reverse Auction Event

(To be signed and stamped by the bidder)

In a bid to make our entire procurement process more fair and transparent, TPC intends to use the reverse auctions through SAP-SRM tool as an integral part of the entire tendering process. All the bidders who are found as technically qualified based on the tender requirements shall be eligible to participate in the reverse auction event.

The following terms and conditions are deemed as accepted by the bidder on participation in the bid event:

1. TPC shall provide the user id and password to the authorized representative of the bidder. *(Authorization Letter in lieu of the same shall be submitted along with the signed and stamped Acceptance Form).*
2. TPC will make every effort to make the bid process transparent. However, the award decision by TPC would be final and binding on the supplier.
3. The bidder agrees to non-disclosure of trade information regarding the purchase, identity of TPC, bid process, bid technology, bid documentation and bid details.
4. The bidder is advised to understand the auto bid process to safeguard themselves against any possibility of non-participation in the auction event.
5. In case of bidding through Internet medium, bidders are further advised to ensure availability of the entire infrastructure as required at their end to participate in the auction event. Inability to bid due to telephone line glitch, internet response issues, software or hardware hangs, power failure or any other reason shall not be the responsibility of TPC.
6. In case of intranet medium, TPC shall provide the infrastructure to bidders. Further, TPC has sole discretion to extend or restart the auction event in case of any glitches in infrastructure observed which has restricted the bidders to submit the bids to ensure fair & transparent competitive bidding. In case of an auction event is restarted, the best bid as already available in the system shall become the start price for the new auction.
7. In case the bidder fails to participate in the auction event due any reason whatsoever, it shall be presumed that the bidder has no further discounts to offer and the initial bid as submitted by the bidder as a part of the tender shall be considered as the bidder's final no regret offer. Any offline price bids received from a bidder in lieu of non-participation in the auction event shall be out-rightly rejected by TPC.
8. The bidder shall be prepared with competitive price quotes on the day of the bidding event.
9. The prices as quoted by the bidder during the auction event shall be inclusive of all the applicable taxes, duties and levies and shall be FOR at TPC site.
10. The prices submitted by a bidder during the auction event shall be binding on the bidder.
11. No requests for time extension of the auction event shall be considered by TPC.
12. The original price bids of the bidders shall be reduced on pro-rata basis against each line item based on the final all inclusive prices offered during conclusion of the auction event for arriving at Contract amount.

Signature & Seal of the Bidder

ANNEXURE VII

Inspection Test Plan

Not Applicable.

Annexure IX

BG Format (EMD BG, PBG/ CPBG)

The Tata Power Company Limited is hereunder referred to as the "Owner" or "Company". The person, firm or company offering the services, the subject of this order is referred to as "Contractor". The subject of this order is hereinafter referred to as the "Work".
"Sub-Contractor" means any person named in the Contract as a Sub-contractor, sub-vendor, manufacturer or supplier for a part of the Works or any person to whom a part of the Works has been subcontracted and the legal successors in title to such Person, but not any assignee of such Person.

The Contract shall mean the contract as derived from the following:

1. Work Order (with 'Commercial Notes' and Annexures to the Work Order referred thereon)
2. Scope of Work.
3. General Terms & Conditions - Service

The documents including all reference document (s) and Annexures forming the Contract are to be read together as a whole and are to be taken as mutually explanatory, provided however, in the event of any inconsistency or discrepancy between the aforementioned documents, the order of precedence in interpretation of the documents shall be as set out above. For the avoidance of doubt, it is clarified that the terms set forth in the Work Order (with 'Commercial Notes' and Annexures to the Work Order referred thereon) shall take precedence over the terms set out in the Scope of Work, which shall in turn take precedence of the terms set out in the General Terms & Conditions – Service.

1. Contractor's obligation:

1.1 Contractor warrants that it is a competent, qualified and experienced contractor, equipped, organised and financed to perform and complete the services in the operating area in an efficient and professional manner and capable of meeting all the requirements of the Contract.

1.2 The Contractor has the overall responsibility of executing the contract, conducting Planning, Job Scheduling, Maintenance Planning, Maintenance Job Scheduling, executing the Work and maintenance jobs as per the Scope of work & schedule.

1.3 Except to the extent that it may be legally or physically impossible or create a hazard to safety, the Contractor shall comply with the Owner's representative(s) instructions and directions on all matters relating to the Work.

1.4 Contractor shall at all times have full responsibility for control of the Equipment and for the direction and supervision of operations being carried out under the Contract.

1.5 In the performance of the Work, Contractor shall be and act as an independent Contractor fully responsible and accountable for the proper execution of its responsibilities, obligations and liabilities under this Contract and for its own acts and the acts of its Sub-Contractors and the Personnel. Owner's supervision, examination or inspection of the (performance of the) Work or omission to carry out the same shall not be construed in any manner whatsoever as relieving Contractor from its responsibilities, obligations or liabilities under this Contract.

1.6 Contractor shall submit list of tools & tackles with details of make, year of manufacturing, valid certification to the Project Manager/ User for their approval.

Project Manager may during the execution of project inspect & verify that the tools & tackles are as per the qualification requirements approved by him and will have right to seek replacements in case of any discrepancies. The Contractor shall always comply with such directives.

1.7 Contractor shall engage Tata Power Skill Development Institute (TPSDI) certified labour force at the site for execution of the job. Requirement & fees for TPSDI certification shall be as per Company Policy.

1.8 Contractor shall take full responsibility for the protection and security of Owner's materials and equipment while such materials and equipment are temporarily stored in Contractor's facility or otherwise in Contractor's custody.

1.9 All notices, instructions, information, and other communications given by the Contractor to Owner under the Contract shall be given to the Order Manager/ Owner's representative, except as otherwise provided for in this Contract.

1.10 The Contractor shall make its own arrangements for movement of personnel and equipment, within and outside the sites / units / offices at the various locations covered by the Contract.

1.11 The Contractor shall acquire in its name all permits, approvals, and/or licenses from all local, state, or national government and other statutory authorities and/or public service undertakings that are necessary for the performance of the Contract.

1.12 Neither the Contractor nor its personnel shall during the term of this Contract, engage in any business or professional activities in India/abroad which would conflict with the activities assigned to them under this Contract.

2. Service Warranties:

Contractor warrants that all services performed for or on behalf of Owner will be performed in a competent,

workmanlike manner and shall be free from faults and defects. Said warranties shall be in addition to any warranties of additional scope given by Contractor to Owner. None of said warranties and no other implied or express warranties shall be deemed is claimed or excluded unless evidenced by a change notice or revision issued and signed by Owner's authorized representative.

3. Compliance of Local Laws:

Contractor shall be responsible and shall comply with the provision of all the Statutory Acts Applicable. Special attention of the Contractor is drawn towards the compliance of provision of the following statues: (along with the latest amendments/additions, as applicable):

a) The Child Labour (Prohibition and Regulation) ACT, 1986.
b) The Contract Labour (Regulation and Abolition) ACT, 1970.
c) The Employee's Pension Scheme, 1995.
d) The Employee's Provident Funds and miscellaneous provisions Act, 1952.
e) The Employees State Insurance Act, 1948.
f) The Equal Remuneration Act, 1976.
g) The Industrial Disputes Act, 1947.
h) The Maternity Benefit Act, 1961.
i) The Minimum Wages Act, 1948.
j) The Payment of Bonus Act, 1965
k) The Payment of Gratuity Act, 1972.
l) The Payment of Wages Act, 1936.
m) The Shops & Establishment Act, 1954.
n) The Workmen's Compensation Act, 1923.
o) The Employer's Liability Act, 1938.
p) and any other applicable statutory act

Site Specific requirements shall be as Annexure at I. The compliance to these Site Specific requirements shall not absolve the Contractor of its obligation to comply with the Owner's Contractor Safety Management Policy.

4. Owner's Obligation:

4.1 The order manager (As specified in the 'Commercial Notes') shall have the authority to represent Owner on all day-to-day matters relating to the Contract or arising from the Contract. All notices, instructions, orders, certificates, approvals, and all other communications under the Contract shall be given by the order manager, except as otherwise provided for in this Contract. The order manager may appoint the Engineer-In-Charges for different areas for monitoring the work progress, inspections and signing of bills.

4.2 Owner shall ensure the availability of site access, all information and/or data to be arranged/ supplied by Owner to the Contractor for execution of the Work . The terms on which the Contractor shall be allowed access to the site shall be specified by the Owner prior to commencement of the execution of the Work and thereafter shall be governed in accordance with such policies as the Owner may provide in writing to the Contractor from time to time.

5. **Contractor's/ Sub-contractor's employees**:

5.1 The Contractor shall engage appropriately qualified persons to provide the services with the prior approval of Owner. Owner may withhold such approval for any reason whatsoever.

5.2 The Contractor hereby represents and warrants that:

i) the personnel are duly qualified, and are, and will remain, sufficiently qualified, careful, skilful, diligent and efficient to provide the services to Owner; and
ii) the Services will be rendered carefully, skilfully, diligently and efficiently, and to the professional standard reasonably expected by Owner of a contractor qualified and experienced in providing services substantially the same as the Services.

5.3 The Contractor must ensure that the Contractor's personnel conduct themselves in a proper manner and comply with the procedures and all policies, regulations and directives of Owner including any occupational, health and safety policies and the relevant prevailing laws and regulations in the Country of operations and specifically in the area where Work is being executed.

5.4 Owner may inform the Contractor to immediately remove Contractor's personnel from the relevant premises in the event of misconduct or incompetence on the part of the Personnel. The Contractor shall at all times remain liable for all acts and/or omissions of its Personnel.

5.5 It is made clear that no relationship of Owner and employee is created between Owner and the Contractor's resident engineers, employees and no claim for employment of any such personnel shall be tenable or entertained.

6. Title of Property:

6.1 Unless otherwise provided in this order or agreed to in writing, property of every description including but not limited to all tooling, tools, equipment and material furnished or made available to Contractor, title to which is

in Owner, and any replacement thereof shall be and remain the property of Owner. Such property other than material shall not be modified without the written consent of Owner. Such property shall be plainly marked or otherwise adequately identified by Contractor as being owned by Owner and shall be safely stored separately and apart from Contractor's property.

6.2 Contractor shall not use such property except for performance of work hereunder or as authorized in writing by Owner. Such property while in Contractor's possession or control shall be listed in writing and kept in good condition, shall be held at Contractor's risk, and shall be kept insured by Contractor, at its expense, in an amount equal to the replacement cost with loss payable to Owner. To the extent such property is not material consumed in the performance of this order, it shall be subject to inspection and removal by Owner and Owner shall have the right of entry for such purposes without any additional liability whatsoever to Contractor. As and when directed by Owner, Contractor shall disclose the location of such property, prepare it for shipment and ship it to Owner in as good condition as originally received by Contractor, reasonable wear and tear excepted.

7. Work Completion schedule:

Contractor shall plan and execute the Work in accordance with a detailed schedule mutually agreed upon by the Parties (Owner and Contractor).

8. Contract Price and Payment:

8.1 The Contract Price shall be a firm & fixed Contract Value for the Work inclusive of all the taxes, levies & duties and shall remain firm till the validity of this contract.

8.2 Unless Specifically stated elsewhere in the contract, the Contractor is solely liable for payment of , and warrants that it will pay, or ensure the payment of all taxes imposed, assessment made in relation to the Work.

8.3 An amount as stated in the table below shall be retained towards Contractor's safety performance against every RA bill:

Contract Value	Retention Amount (%)
Upto Rs. 10 lakhs	2.5
Above Rs. 10 lakhs and below Rs. 50 lakhs	2
Above 50 lakhs and upto Rs. 10 Crores	1.5
Above Rs. 10 Crores	1

The above mentioned safety retention shall be over and above any other retentions/ deferred payments as may have been specifically agreed in the Contract.

8.4 For Contract Price Rs. 1 crores or above and Contract Completion Schedule 12 months or more, the above safety retention will be released half yearly against the Safety Performance Score (methodology for evaluation enumerated in the Safety Terms & Conditions attached as Appendix to this General Terms & Condition) which will be evaluated by the Order Manager every month. For all other contracts, the above said safety retention shall be released along with the final settlement only at the end of the contract period.

8.5 The Owner shall have the right to stop any work which in its opinion is not meeting the safety standards/ guidelines of the Owner and good engineering practice. The Contractor shall not be eligible for and shall not be granted any extension in Completion Schedule due to such stoppage of work by the Owner.

8.6 The above retention towards safety shall not absolve the Contractor of its liabilities including statutory liabilities towards safety violations, injury or death (whether by accident or otherwise). An amount between Rs. 5 to 50 lakhs as deemed appropriate by Owner's appointed Committee for incident investigation and/ or as determined by statutory authorities (whichever higher), will be payable by the Contractor in case of such severe incidents of injury leading to loss of property or partial/ permanent disablement (e.g. loss of limb/s, vision etc.) or death.

8.7 Notwithstanding anything else stated in the Contract, the Contract shall be liable for termination without any notice and without recourse to Owner in case of three (3) or more severe safety violations. There shall be no termination fees/ compensation payable to Contractor for such termination.

8.8 In case the Contractor achieves 100% on the Safety Performance Score, the Contractor shall be awarded a discretionary bonus of 1% of invoiced value subject to a maximum of Rs. 50 lakhs towards Safety Performance.

8.9 Payment shall be released within 60 days of submission of error free invoice with supporting documents duly certified by the Order Manager/ Engineer-in-Charge after deducting taxes at source as prescribed under the applicable law, income – tax or other deductions under the state value added tax laws . If such payment release

day falls on a holiday of Owner, payment will be released on the next working day. Against deduction of statutory taxes, tax deduction certificates where ever applicable shall be issued as per the applicable provisions of the statute. The Order Manager may recover any amount wrongly paid in excess in any previous bills certified by him.

8.10 *Mode of Payment*: All payments shall be made direct to the Contractor or his authorized representative in the shape of RTGS or Electronics Transfer method, on certification of the Order Manager/Engineer-in-Charge and on compliance of contractual terms & conditions.

9. **Taxes and Duties:**

9.1 The Contract Price shall be inclusive of all taxes, duties, including but not limited to Customs duty, GST or any local taxes, levies imposed by State/Central/Local governments.

9.2 Taxes as mentioned in the Contract Price or Price Schedule shall be paid to the contractor subject to the Contractor complying with all the statutory requirements and furnishing the relevant documents including error free invoices containing detailed break up of the taxes.

9.3 The tax invoices should contain the details to comply with the GST Law. The supplier shall:

i) Furnish (electronically) and communicate to the Owner, the details of Goods or Services supplied by the 10th of the month succeeding the said tax period,
ii) Upon discovery of any discrepancy, rectify it and shall pay the tax and interest thereof,
iii) Furnish the returns (electronically), for the inward and outward supplies of Goods and/or Services, before the specified dates as per the GST Law,
iv) Communicate the tax paid, credits etc. as and when credited.
v) The Invoice should clearly state the description of the goods, quantity, sale price, tax %, and tax amount;
vi) The Invoice should be signed by an Authorized Signatory.

Bills/Invoices in the name of The Tata Power Company Ltd. with packing lists in triplicate shall be forwarded along with the equipment.

Contractor to furnish GST Registration no. in all invoices as well as Purchaser's (Tata Power's) GST no.

9.4 However the payment of tax shall be restricted to the total amount as indicated in the price schedule.

9.5 Any statutory variation in duties, levies or taxes if applicable and specified in this Contract till the scheduled date for completion of Work and limited to direct invoices of the Contractor shall be to the account of Owner. The Contractor shall have the obligation to provide the necessary documentary evidence / supporting by way of gazetted notifications etc. to prove the change in such levies or taxes between the due date of submission of the Bid and the scheduled date of completion of work to claim the difference.

9.6 The Contractor shall pass on to the Owner all the benefits of either reduction in tax rates, exemptions, concessions, rebate, set off, credits etc. or introduction of new tax rates exemptions, concessions, rebate, set off, credits etc. pertaining to all taxes, duties, imposts, fees and levies in respect of the supplies of Goods or performance of obligations under the contract. This would specifically include reduction of tax rates as a result of statutory changes or judicial rulings.

9.7 Any other taxes, levies and duties not mentioned in Contract Price or Price Schedule but applicable as per any statute (s) or introduction (omission) of new taxes, levies and duties shall be deemed to be included in the Contract Price and shall be to the account of the Contractor.

9.8 For facilitating availment of a credit, set-off, rebate, drawback or like benefit available to the Owner, the Contractor will facilitate the Owner by providing the necessary documentary and/or procedural support. In any process of assessment or re-assessment, of taxes payable by the Owner,

9.9 The Contractor shall bear and pay all the costs, liabilities, levies, interest, penalties in respect of non-compliances of any legal requirements as per various statutory provisions. The contractor shall keep the owner indemnified at all times from any tax liability, interest, penalties or assessments that may be imposed by the statutory authorities for non-compliances or non-observation of any statutory requirements by the Contractor.

9.10 All formalities required under statutes, for availing any concessions under relevant tax laws shall be adhered to by the Contractor.

9.11 Deduction at source: Recovery at source towards income tax calculated at the rate prescribed from time to time under the Income Tax Act 1961 and other relevant sections of Income Tax Act shall be made from the bills of the Contractor and the amount so recovered shall be

deposited with the Income Tax Department. Necessary TDS certificate to this effect will be issued to the Contractor in the prescribed pro-forma.

9.12 If any other taxes / duties / cess etc are to be recovered at source as per government regulations / Legislation from time to time, the same shall be recovered from the bills payable to the Contractor. Necessary receipt to this effect will be issued to the Contractor in this regard as per the applicable legislation.

10. Contract Performance Guarantees (If applicable)

The Contractor shall within 15 days of issuance of this Order/Contract furnish an unconditional irrevocable bank guarantee duly stamped, strictly as per the prescribed format of Owner from any nationalized bank or any scheduled bank having a branch in Mumbai and approved by the Owner for a sum equivalent to 10% of the Total Contract Price valid for the Contract Period and with a claim period of not less than 6 months from the completion of Contract Period. The issuing bank should be advised to send a direct confirmation of issue of bank guarantee to Owner.

In case the Contractor fails to furnish the requisite Bank Guarantee as stipulated above, then the Owner shall have the option to cancel the Contract besides other contractual remedies.

11. Price Reduction:

11.1 In case the Contractor fails to deliver the service/ Complete the work as per the agreed Completion Schedule including intermediate milestones (if applicable), the Owner shall recover from Contractor, as ascertained and agreed Liquidated Damages, and not by way of penalty, a sum equivalent to 1% of the Contract Value per week of delay. The Liquidated Damages referred above may be recovered by the Owner as set off against any amounts payable by the Owner to the Contractor or in any other manner in accordance with applicable laws.

11.2 The overall cap on liquidated damages shall be limited to 10% of the Contract Price.

12. Insurance

12.1 The Contractor agrees to indemnify and protect Owner against all liability, claims or demands for injuries or damages to any person or property growing out of the performance of this order/ Contract.

12.2 The Contractor further agrees to furnish evidence of insurance showing that Contractor has and will maintain adequate insurance coverage during the life of this Contract/ order in the opinion of Owner, including but not limited to comprehensive general liability insurance. Such evidence of insurance must set forth the name of the insurer, policy number, expiration date, and limits of liability. Compliance by Contractor with insurance requirements does not in any way affect Contractor's indemnification of Owner under Indemnification clause

13. Indemnification:

The Contractor shall indemnify, save harmless and defend the Owner and keep the Owner indemnified from and against any and all claims, costs, liabilities (financial), litigations, compensations, judgments, expenses or damages (including attorney's fees and other related expenses) arising out of any breach or alleged breach of any of the conditions of this Contract including compliance to statutory laws of provisioned under clause 3, performance of the obligations hereunder, or any representation or misrepresentation made by the Contractor or by any third party in respect of death or bodily injury or in respect to loss or damage to any property with regard to the subject of this Contract.

14. Indemnity against IPR:

The equipment, system, drawings, and other materials that shall be supplied against the Contract will become the Owner's property. Without limitation of any liability of whatsoever nature, the Owner shall be indemnified and kept indemnified against any claim for infringement or breach of any of the statues, rules & regulations by the use of or sale of any article or material supplied by the Contractor. The indemnity shall include any infringement of patent, trade mark, design, copyright or other property rights whether in Country of Origin, or elsewhere resulting from the Contractor's design, manufacture, use, supply or re-supply & would also cover use or sale of any article or material supplied by the Contractor to the Owner under the Contract. The Indemnity shall cover any claim/action taken by a third party either directly against the Owner or any claim/action made against the Contractor & where under the Purchaser is made liable. The Indemnity shall be for losses, damages, and costs including litigation costs, attorney fees etc incurred by the Owner in relation to the Contract.

15. Free Issue Material:

Wherever contracts envisage supply of Free Issue Material (FIM) by the Owner to the contractor for fabrication/ use in service performance, such Free Issue Material shall be safeguarded by an insurance policy to be provided by the Contractor at his own cost for the full value of such materials and the insurance policy shall cover the following risks specifically and shall be valid for six months beyond the Contract Validity date :

RISKS TO BE COVERED: Any loss or damage to the Owner's materials due to fire, theft, riot, burglary,

strike, civil commotion, terrorist act, natural calamities etc. and any loss or damage arising out of any other causes such as other materials falling on Owner' s materials.
The amount for which insurance policy is to be furnished shall be indicated in the respective Contract.

Free Issue material (FIM) will be issued to the Contractor only after receipt of the Insurance Policy from the Contractor. The contractor shall arrange collection of the FIM from the Owner's premises and safe transportation of the same to his premises at his risk and cost. Notwithstanding the insurance cover taken out by the Contractor as above, the Contractor shall indemnify the Owner and keep the Owner indemnified to the extent of the value of free issue materials to be issued till such time the entire contract is executed and proper account for the free issue materials is rendered and the left over/surplus and scrap items are returned to the Owner. The contractor shall not utilize the Owner's free issue materials for any job other than the one contracted out in this case and also not indulge in any act, commission or negligence which will cause/result in any loss/damage to the Owner and in which case, the Contractor shall be liable to the Owner to pay compensation to the full extent of damage/loss. The Contractor, shall be responsible for the safety of the free issue materials after these are received by them and all through the period during which the materials remain in their possession/control/custody. The Free issue materials on receipt at the Contractor's works shall be inspected by them for ensuring safe and correct receipt of the material. The contractor shall report the discrepancies, if any, to the Owner within 5 days from the date of receipt of the material. The contractor shall take all necessary precautions against any loss, deterioration, damage or destruction of the FIMs from whatever cause arising while the said materials remain in their possession/custody or control. The free issue materials shall be inspected periodically at regular intervals by the Contractor for ensuring safe preservation and storage, the Contractor, shall also not mix up the materials in question with any other goods and shall render true and proper account of the materials actually used and return balance remaining unused material on hand and scrap along with the final product and if it is not possible within a period of one month from the date of delivery of the final product/ completion of Service covered by this Contract. The Contractor shall also indemnify the Owner to compensate the difference in cost between the actual cost of the free issue material lost/damaged and the claim settled to the Owner by the insurance company.

16. Relation between parties:

The Contract shall be entered into on a principal-to-principal basis only. The Contract shall not be construed as a partnership or an association of persons. There is no agent and principal relationship between the parties. Each party shall be responsible for its own conduct. The Contractor shall ensure at all times that all the work carried out under this contract either by its own person or through any of its sub-Vendors shall be always done under its own direct supervision.

17. Safety:

Contractor shall comply with all legal and statutory provisions including all rules and regulations pertaining to Safety, Health and the Environment and will be responsible for all legal liabilities arising due to any of their acts or of their personnel.

The Contractor shall comply with the Owner's Contractor Safety Policy and Safety Terms and Conditions. Any misconduct and/ or violation with respect to the Owner's Contractor Safety Policy and Safety Terms and Conditions or any other legal and statutory provisions pertaining to Safety, Health and Environment shall be dealt with as per the Safety Terms and Conditions.

Prior to commencement of any work at site Contractor shall submit an undertaking in writing to adhere to and comply with all the provisions of Owner's Contractor Safety Code of Conduct.

The Contractor shall have a valid ISO 14001/ OHSAS certification. In absence of the same, the Contractor shall obtain the same within 6 months from the date of the Effective Date of Contract.

18. Suspension of Work

Owner may instruct Contractor at any time to suspend performance of the Work or any part thereof with a notice of 7 days for whatever reason. Provided Contractor is not in default under this Contract subject to Articles 1 and 5 inclusive, the Contractor shall be paid a mutually agreed fee, if any, necessarily incurred by Contractor as a direct consequence thereof of suspension and the Project Completion Schedule may be revised accordingly.

Without prejudice to any other rights Owner may have under this Contract or at law if Contractor is in default under this Contract, Owner may instruct Contractor to suspend performance of the Work or any part thereof by giving 7 days notice till such default has been corrected to the satisfaction of Owner. Also Liquidated Damages in accordance with Clause 11 shall continue to be applicable during such period until the default is cured. The costs incurred by the Contractor for such correction shall be to the Contractor's account, and furthermore no payment shall become due to the Contractor. Any cost incurred due to non - performance of the Contractor by the Owner shall be charged to the Contractor.

19. Change Management:

Owner shall have the right at any time to order any change in the Work in accordance with the following procedure. Contractor shall furnish to Owner upon request as soon as reasonably possible but no later

than five (5) days following the request, a written statement specifying:

(a) the increase or decrease, as the case may be, in the costs of the Work which will result from a change in the Work as requested by Owner,

(b) any effect such change in the Work may have on any other provision of this Contract originating from either parties, and

(c) such other details as Owner may require.

Any change in costs shall be reasonably related to the proportional change in the Work and any other costs incurred by Contractor. If Owner agrees to Contractor's statement Owner shall notify Contractor thereof in writing in the form of a change order, whereupon the change in the Work shall be incorporated in the Work and immediately implemented. In the event that the change relates to a reduction in Work, the work in question shall not be undertaken pending the issue of an appropriate Change Order.

20. Governing Laws

This Contract shall be construed in accordance with and governed by the Laws of India without giving effect to any principle of conflict of law.

21. Jurisdiction

This Contract and the transaction contemplated herein shall be subject to the exclusive jurisdiction of the competent Courts in Mumbai only.

22. Dispute settlement:

Dispute or differences arising out or relating to this Order shall be resolved amicably by the parties. Failing such amicable resolution of dispute / differences either party may refer the matter to arbitration of a Sole Arbitrator to be appointed jointly by both the parties. The award of the Arbitrator shall be final, binding and conclusive on the parties. The venue for arbitration shall be Mumbai. The Arbitration proceedings will be governed and regulated by the provisions of Indian Arbitration and Conciliation Act, 1996 as amended from time to time and the rules framed there under.

23. Force majeure:

23.1 In the event of either party being rendered unable by force majeure to perform any obligation required to be performed by it under this Contract the relative obligation of the party affected by such force majeure shall, after notice under this articles be suspended for the period during which such cause lasts. The term 'Force Majeure' as employed herein shall mean acts of God, wars (declared or undeclared), riots or civil commotion, fire, floods, and acts and regulations of the Government of India or State Government or any of the statutory agencies. Both the party shall pay to the other party, the amount payable upon the date of the occurrence of such force majeure.

23.2 Upon the occurrence of such cause and upon its termination, the party alleging that it has been rendered unable as aforesaid, thereby shall notify the other party in writing immediately but not later than twenty four (24) hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of the claims.

23.3 During the period, the obligations of the parties are suspended by force majeure; the contractor shall not be entitled to payment of any rate.

23.4 In the event of the force majeure conditions continuing or reasonably expected to continue for a period more than thirty (30) days, Owner shall have the option of terminating the contract by giving seven (7) days notice thereof to the contractor.

24. Sub letting and Assignment

The contractor shall not, without prior consent in writing of the Owner, sublet, transfer or assign the contract or any part thereof or interest therein or benefit or advantage thereof in any manner whatsoever, provided nevertheless that any such consent shall not relieve the contractor from any obligation, duty or responsibility under the contract.

25. Limitation of Liability:

Notwithstanding anything contained in the Contract, the Contractor's aggregate liability under this Contract shall be limited 100% of the Total Contract value. This shall exclude liability arising pursuant to clause 3-Compliance to Local Laws, clause 9.10, clause 14-Indemnity against IPR, clause 13- Indemnity, clause 26 – Confidentiality, liability arising due to loss of or damage to the Free Issue Material (FIM) issued by Owner to Contractor for completion of the Work and liability arising due to wilful misconduct, gross negligence, third party claims and corrupt acts attributable to the Contractor.

26. Confidentiality:

The Contractor shall use the Confidential Information of the Owner only in furtherance of this Contract and shall not transfer or otherwise disclose the Confidential Information to any third party. The Contractor shall (i) give access to such Confidential Information solely to those employees with a need to have access thereto; and (ii) take the same security precautions to protect against disclosure or unauthorized use of such Confidential Information that the party takes with its own confidential information but, in no event, shall a party apply less than a reasonable standard of care to prevent such disclosure or unauthorized use.

27. Termination:

27.1 The Contract shall be deemed to be terminated on completion of the Contract period.

27.2 Termination of default by Contractor:
Owner may terminate the contract at any time if the Contractor fails to carry out any of his obligations under this Contract. Prior to termination, the Contractor shall be advised in writing of the causes of unsatisfactory performance to be improved upon 15 days of the receipt of notice. In case, if the Contractor fails to bring about the improvement to the satisfaction of the Owner, then the Contract shall be terminated.

27.3 Without prejudice to the rights and remedies available to Owner, Owner may terminate the Contract or part thereof with immediate effect with written notice to the Contractor if,:

27.3.1 The Contractor becomes bankrupt or goes into liquidation.

27.3.2 The Contractor makes a general assignment for the benefit of creditors.

27.3.3 A receiver is appointed for any substantial property owned by the Contractor.

27.3.4 The Contractor is in breach of any representation or warranty made to the Owner by the Contractor.

The Contractor shall not be entitled to any further payment under the Contract if the Contract is terminated. If the order is terminated under clause 27.2 and 27.3, the Contractor shall not be entitled to any further payment, except that, if Owner completes the Work and the costs of completion are less than the Contract Price, the Owner shall pay Contractor an amount properly allocable to services fully performed by Contractor prior to termination for which payment was not made to Contractor. In case, the cost of completion of Work exceeds the Contract Price, the additional cost incurred by Owner for such completion shall be paid by the Contractor.

27.4 Owner shall be entitled to terminate the Contract at it's convenience, at any time by giving thirty (30) Days prior notice to the Contractor. Such notice of termination shall specify that termination is for Companies convenience and the date upon which such termination becomes effective. Upon receipt of such notice, the Contractor shall proceed as follows:

27.4.1 cease all further work, except for such work as may be necessary and instructed by the Owner/ Owner's representative for the purpose of preserving and protecting Work already in progress and protect materials, facilities and equipment on the Work Site or in transit;

27.4.2 stop all further sub-contracting or purchasing activity, and terminate Sub-contracts;

27.4.3 handover all Documents, equipment, materials and spares relating to the portion of Work already executed by the Contractor or procured from other sources up to the date of termination for which the Contractor has received payment equivalent to the value thereof; and

27.4.4 handover those parts of the supplies manufactured/ work executed by the Contractor up to the date of termination.

Upon termination pursuant to clause 27.4, the Contractor shall be entitled to be paid (a) all sums properly due to the Contractor under the Contract up to the date of termination; and (b) any direct and substantiated charges already incurred or committed for cancellation of the procurement of third party goods or services which were to have been supplied by the Contractor in connection with this Contract provided that the Contractor shall use its best endeavours to minimise such charges

25.5 The Contractor shall not be released from any of his obligations or liabilities accrued under the Contract on termination. For the avoidance of doubt, the termination of the Contract in accordance with this clause shall neither relieve the Contractor of his accrued obligations for Warranty or his accrued liability to pay (liquidated) damages for Delay nor shall entitle him to reduce the value of Performance Security.

28. Consequential Damages:

Unless otherwise specified, neither Party shall be responsible for and nor shall be liable to the other Party for indirect/consequential losses and damages suffered by such Party including for loss of use, loss of profit whether such liability or claims are based upon any negligence on the part of the other Party or its employees in connection with the performance of the Contract.

29. Environment / ISO 14001 Certification:

The Contractor to confirm whether their organization is ISO 14001 certified. If not, the Contractor must certify that the handling, use and disposal of their product / by-products conform to practices consistent with sound environmental management and local statutes. The Contractor shall ensure that all the wastes are disposed in environmental friendly way with strict compliance to applicable laws including adherence to MoEF guidelines with respect to disposal of batteries, lead waste, copper cables, ash, waste oil, e-waste etc which shall be disposed through MoEF approved

parties only. The Contractor shall also be responsible to collect and recycle all the e-waste generated at the end of the product life cycle at its own costs and risks as per the MoEF guidelines/ orders.

30. Non-Exclusive Agreement

This Contract is non-exclusive and Owner reserves the right to engage other contractors to perform similar or identical work. Contractor shall accord such other contractors adequate opportunity to carry out their contracts and shall accomplish the Work in co-operation with those contractors and with Owner, in accordance with such instructions as may be issued by the Owner from time to time.

31. Severability

In the event that any of the provisions, or portions or applications thereof, of this Contract are held to be unenforceable or invalid by any court or arbitration panel of competent jurisdiction, Contractor and Owner shall negotiate an equitable adjustment to the provisions of the Contract with a view towards effecting the purpose of the Contract and the validity and enforceability of the remaining provisions, or portions or applications thereof, shall not be affected thereby.

32. Housekeeping & Removal of scrap:

The Contractor shall be responsible for keeping the areas of his work at site, neat and tidy throughout the period of his work. All excess material/ spares/ consumables taken by Contractor, as well as the scrapped items and wooden logs/ crates/ planks shall be returned, from time to time, to the Stores, and transported/ unloaded by Contractor's personnel at the place shown by Order Manager/Engineer-in charge.

The Contractor shall so arrange that all the scrap generated during the progress of his work, is separated into two categories, viz.

i) Saleable scrap like steel, copper or other metals, etc., and,

ii) Others, which have nil or negligible resale value, like insulation material, jute, debris, etc. (or as directed by the Order Manager/Engineer-in charge).

The saleable scrap shall be shifted to and unloaded at a central place as per directions of the Stores-in charge, while the other scraps shall be shifted to other locations as per directions from Order Manager/ Engineer-in Charge, or as per terms of the order.

The Contractor shall arrange to remove the scrap on regular basis, or even on daily basis, depending upon the requirement, to keep the area around his work-place neat and tidy. In case, it is observed that the Contractor is not carrying out regular cleaning of his areas of work, or, is not returning the excess materials/ scrap, etc., to the Stores, Owner reserves the right to arrange the same through other sources, and back-charge the Contractor the cost of doing so, along-with overheads, by deducting the amount from Contractor's bills.

Contractor's final bill will be cleared by Owner only after confirming that proper clearing of his areas of work has been completed by the Contractor, and same is certified by the Order Manager/ Engineer in-charge

33. Tata Code of Conduct

The Owner abides by the Tata Code of Conduct in all its dealing with stake holders and the same shall be binding on the Owner and the Contractor for dealings under this Order/ Contract. A copy of the Tata Code of Conduct is available at our website: http://www.tatapower.com/aboutus/code-of-conduct.aspx. The Contractor is requested to bring any concerns regarding this to the notice of our Chief Ethics Officer on the e-mail ID: cecounsellor@tatapower.com.

34. Responsible Supply Chain Management:

The Owner is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy. The Contractor is required to comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations. The Owner encourages its Vendors/ Contractors/ Business partners to pay more attention to green design, green supply, green production, green logistics and green packaging in performing their business obligations.

The Contractor is required to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy.

A copy of the Responsible Supply Chain Policy along with Environment policy, Energy Conservation policy, Sustainability policy, Health & Safety policy and Human Rights policy is available at website: http://www.tatapower.com/sustainability/policies.aspx.

Contractor/Bidder is required to completely fill the attached "Supplier Sustainability Questionnaire" in support of their Green Supply Chain Management initiatives and submit the same with their offer.

The Owner recognizes that diversity in the workplace positively impacts business. The Owner is committed to help people from SC/ST background either by helping them to become entrepreneurs or by engaging workforce from SC/ST community under the contracts agreed herein. To encourage engaging SC/ST community, the owner may consider on the merit to incentivize the Contractor by paying additional 1% of

the service contract portion if the number of SC/ST workforce engaged in the contract exceeds 30% of the total deployed strength and 2%, if the strength goes beyond 50%. While the Contractor will assist the workforce so engaged to become self-reliant in meeting the work expectation, the Owner may also volunteer its training resources to the extent possible to improve their employability. The Contractor shall maintain the proper documentation of such category of the workforce engaged and the owner may consider to pay the incentive after its verification.

The Owner may also consider extending price preference of 5% in the bid evaluation for an order value up to Rs.50 Lacs, provided the company is owned by a person from SC/ST community having minimum 50% holding in the company.

35. Vendor rating:

You are requested to ensure compliance to the terms of the individual orders with regards to timely delivery, provision of all applicable documents / challans / test certificate, quality of the material etc. Your performance with respect to the said factors will be taken into consideration for future business.

36. Vendor Feedback:

34.1 In this dealing Vendors feedback is important for the purchaser to improve its processes. If Contractor have to report any grievance, problem or require any clarification, information, Contractor is requested to contact purchaser at email ID: CC_CUSTOMERFEEDBACK@tatapower.com

34.2 Contractor is requested to ensure compliance to the terms of the individual orders with regards to timely delivery, provision of all applicable documents / challans / test certificate, quality of the material etc. Contractor performance with respect to the said factors will be taken into consideration for future business.

37. Non-Waiver:

Failure of Owner or its representatives to insist upon adherence to any of the terms or conditions incorporated in the Contract or failure or delay to exercise any right or remedies herein or by law accruing, or failure to promptly notify the Contractor in the event of breach or the acceptance of or the payment of any Material(s) hereunder or approval of any design or Material(s) shall not release the Contractor and shall not be deemed a waiver of any right of Owner to insist upon the strict performance thereof or of any of its rights or remedies as to any such Material(s) regardless of when the Material(s) are shipped, received or accepted not shall any purported oral modification or revisions of the Contract by Owner or its representative(s) act as waiver of the terms hereof.

ESG FRAMEWORK FOR BUSINESS ASSOCIATES

Tata Power's Sustainability philosophy sits at the core of its Business Strategy. Tata Power Sustainability Model has an overarching objective of 'Leadership with care' with key elements of 'Care for the Environment'; 'Care for the Community'; 'Care for our Customers / Partners' and 'Care for our People'. These sustainability objectives encompass the Environmental, Social and Governance objectives driven as integrated elements.

Tata Power, together with its stakeholders is determined to achieve sustainable growth while creating shared value for all.
As a part of future ready roadmap, Tata Power has targeted following as our Environment, Social and Governance priorities:

- Being Carbon Net Zero before 2045
- Growing Clean capacity (80% by 2030)
- Customer centricity
- Becoming water neutral before 2030
- Achieving zero waste to landfill before 2030
- No net loss of biodiversity before 2030
- Positively impacting 80 million lives by 2027

In order to create a sustainable business ecosystem, Tata Power expects that all its Business Associates (BA) which includes its suppliers, vendors, consultants and service providers to align to its ESG and sustainability commitments.

Tata Power encourages improved efficiencies and scaling up of green initiatives through technology and innovation taking us farther on the journey of reducing carbon emissions and preparing the entire eco-system towards products and services that would have net positive impact on the environment and communities that we operate in.

The Vendors/ bidders wishing to associate with Tata Power are expected to share their own sustainability and ESG journey. We at Tata Power promote all Business Associates to have a sustainable procurement policy for their supplier and service providers to contribute to our integrated approach in achieving a sustainable supply chain. The BA is encouraged to carry out the assessment of their sub-contractors and sub-vendors on sustainability readiness so that they are aware of the expectation/ business requirement.

The Vendor/ Bidder shall fill-in the 'Environment, Social and Governance Compliance Screening Questionnaire for Business Associates' attached at Annexure-I and submit the same along with the Bid in Ariba online platform.

Responsible Supply Chain Management:

Tata Power is committed for a cleaner environment and respect of Human rights through its Responsible Supply Chain Management policy.
Tata Power Business Associate (BA) shall comply with all the environment & Human rights related laws, including emission norms, Labour and environmental regulations.

Tata Power encourages its BA to focus on green design, green supply, green production, green logistics and green packaging in performing their business obligations. The BA is expected to abide by the Tata Power Corporate Environment policy, Energy Conservation and Corporate Sustainability Policy (enclosed with this document as Annexure-II).

The BA is expected to:

- Strive towards Conservation of Energy, Water, Resources and optimize transportation of Men & Materials to minimize environmental impact and reduce carbon footprint.
- Carry out the assessment of materials used for construction, operation & maintenance, consumables and accordingly phase out those materials which are environmentally hazardous.
- Be cognizant that diversity in the workplace positively impacts business.
- Promote affirmative action by supporting people from SC/ ST background by engaging workforce from SC/ ST community under the contracts agreed herein.
- Share the commitment of 'No child labour', 'No forced labour', Non-discrimination on the basis of caste, colour, religion, gender, disability, maternity or pregnancy or any other factor unrelated to the requirements of the job
- Pay the wages or remuneration to the workforce, personnel deployed in compliance to all applicable laws and regulations.
- Provide its employees/ deployed labor with an employment environment that is free of physical or psychological harassment.
- Carry out the assessment of their Sub-contractors on their Sustainability Readiness so that they are aware of the above expectation/ standards
- To ensure usage of suitable package material which is more environmentally sustainable. Further the packing material shall be recycled to the extent possible. The material used for packing is expected to suit the mode of transport and to ensure its safe receipt at point of delivery.

Waste Disposal:

The BA is expected to follow best practices for disposal of waste, few of which are listed below:

- Have a detailed project plan that includes the waste management, segregation of all designated waste material (Recyclable/ Non-Recyclable), collecting, storing, disposing and transferring the same to pre-arranged facility/ destination in timely and safe manner as per environmental legislations. The project plan shall also include the innovative construction practice to eliminate or minimize waste, protect surface/ground water, control dust and other emissions to air and control noise.

- Have purchase policy to encourage the procurement of material with recycled and minimum packaging of goods during delivery and appropriate means for site-to-site transportation of materials to avoid damage and litter generation.

- Ensure that the residents living near the site are kept informed about proposed working schedule and timings/ duration of any abnormal noise full activity that is likely to happen.

- Ensure the regular maintenance and monitoring of vehicles and equipment for efficient fuel use so that emissions and noise are within acceptable limits to avoid air pollution.

Water Management:

The BA is expected to follow best practices for water management, few of which include a management and monitoring system for water withdrawals and consumption, procedures to reduce water usage or reuse/recycle water, and pretreatment of wastewater before disposal.

Compliance to Law:
The BA shall adhere to responsible business practices and comply with the provision of all the Statutory Acts Applicable. Special attention of the BA is drawn towards the compliance of provision of the following statues: (along with the latest amendments/additions, as applicable):

- The Child Labour (Prohibition and Regulation) ACT, 1986.
- The Contract Labour (Regulation and Abolition) ACT, 1970.
- The Employee's Pension Scheme, 1995.
- The Employee's Provident Funds and miscellaneous provisions Act, 1952.
- The Employees State Insurance Act, 1948.
- The Equal Remuneration Act, 1976.
- The Industrial Disputes Act, 1947.
- The Maternity Benefit Act, 1961.
- The Minimum Wages Act, 1948.
- The Payment of Bonus Act, 1965
- The Payment of Gratuity Act, 1972.
- The Payment of Wages Act, 1936.
- The Shops & Establishment Act, 1954.
- The Workmen's Compensation Act, 1923.
- The Employer's Liability Act, 1938.
- and any other applicable statutory act

Social Accountability (SA 8000):

Tata Power expects its BAs to follow guidelines of SA 8000:2014 on the following aspects

- Child Labour
- Forced or Compulsory Labour
- Health & Safety
- Freedom of Association & Right to Collective Bargaining
- Discrimination
- Disciplinary Practices
- Working Hours
- Remuneration
- Management System

Health and Safety

The BA is expected to ensure the health and safety of his and his Sub-contractor’s staff and labour. The BA shall, in collaboration with and according to the requirements of the local health authorities, ensure that medical staff, first aid facilities, sick bay and ambulance service are available at the accommodation and on the Site at all times, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The BA shall maintain records and make reports concerning health, safety and welfare of persons deployed, and damage to property, as the Owner’s Representative may reasonably require. The BA shall be responsible for the medical treatment / hospitalization of his and his Sub-contractor’s staff/ labour.

The BA shall appoint a qualified Safety officer at the Site to be responsible for maintaining the safety, and protection against accidents, of all personnel on the Site. Such Safety officer shall have the authority to issue instructions and take protective measures to prevent accidents.

The BA shall comply in toto with the Tata Power's Contractor Safety Terms & Conditions, Health Safety & Environment Manual while working on Tata Power Site/ Services/ Contracts.

Grievance Mechanism

The BA is expected to have grievance procedures that allow stakeholders to anonymously bring environmental and/or work-related violations and/or concerns to the attention of management. In addition, the BA is expected to have procedures for examining reports of environmental and/or work-related violations or concerns and/or privacy complaints.

Data Protection

The BA is expected to have a formal process to address data security or privacy issues.

ANNEXURE-I

Sr. No.	Question Description	Response (Y/N)	Remarks
Organization			
1	Does your Company have Sustainability Policy at Organization Level? If Yes, Please attach		
2	Do you have sustainable procurement policy in place for your own suppliers? If Yes, Please attach		
3	Does your company do regular assessment of its suppliers on ESG parameters?		
4	Are there ESG risks, or negative impacts identified in your supply chain		
Governance			
1	Is diversity taken into consideration when appointing board members/ senior management? Do you have an independent director/s?		
2	Has your company taken initiatives to ensure ethical practices at workplace? Please share the details, Policies etc.		
3	Does your company have a formal process to address data security or privacy issues? Please share the details, Policies etc.		
4	Does your company have grievance mechanism for stakeholder issues and track resolution?		
Environment/ Planet			
1	Does your company have Environmental Policy? If Yes, Please attach		
2	Do you have a formal process for waste management including solid wastes, liquid wastes and hazardous waste?		
3	Does your company track greenhouse gas emission? Also, what percentage of own consumption comes from the renewable energy?		
4	Does your company have a formal process for water management including monitoring of water consumption and withdrawals, and if applicable, pretreatment of wastewater?		
Green Technology/ Innovation			
1	Are your facility/ Product/ Services provided by you is based on green design, green production, green packaging or green logistics considerations? Please elaborate.		
2	Do your products or services have any environmental or social features or benefits (e.g. environmental/energy certification, ecolabels, fair trade certification, etc.)?		
Social/ People			
1	Does you facility/ Company have written personnel policies in place Are you an equal opportunity employer?		
2	Please describe any formal programme / campaign in place to promote company involvement with the community (volunteering, etc.). What is the percentage of profit spend on community activities?		
3	Does your company have a written Health & Safety Policy or Program? If Yes, Please attach		
Certifications: Does your company have following certifications (valid till date-please mention validity)			
1	ISO9001 accreditation		
2	SA8000 or equivalent		
3	ISO 14001 certification		
4	ISO 18001/45001 or equivalent		
5	ISO/IEC 27001 or equivalent		
6	Any Other (Please specify)		

Signature

Business Associate Name

ANNEXURE-II

CORPORATE SUSTAINABILITY POLICY

At Tata Power, our Sustainability Policy integrates economic progress, social responsibility and environmental concerns with the objective of improving quality of life. We believe in integrating our business values and operations to meet the expectations of our customers, employees, partners, investors, communities and public at large

- We will uphold the values of honesty, partnership and fairness in our relationship with stakeholders
- We shall provide and maintain a clean, healthy and safe working environment for employees, customers, partners and the community
- We will strive to consistently enhance our value proposition to the customers and adhere to our promised standards of service delivery
- We will respect the universal declaration of human rights, International Labour Organization's fundamental conventions on core labour standards and operate as an equal opportunities employer
- We shall encourage and support our partners to adopt responsible business policies, Business Ethics and our Code of Conduct Standards
- We will continue to serve our communities:
    - By implementing sustainable Community Development Programmes including through public/private partnerships in and around our area of operations
    - By constantly protecting ecology, maintaining and renewing bio-diversity and wherever necessary conserving and protecting wild life, particularly endangered species
    - By encouraging our employees to serve communities by volunteering and by sharing their skills and expertise
    - By striving to deploy sustainable technologies and processes in all our operations and use scarce natural resources efficiently in our facilities
    - We will also help communities that are affected by natural calamities or untoward incidence, or that are physically challenged in line with the Tata Group's efforts

The management will commit all the necessary resources required to meet the goals of Corporate Sustainability.

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER
Lighting up Lives!

RFQ No.: CC24VKD032

ANNEXURE VIII

General Conditions of Contract

Section A6 : Earnest Money Deposit Bank Guarantee Format

Note: a) Format shall be followed in toto

b) Claim period of six months must be kept up

c) The guarantee to be accompanied by the covering letter from the bank confirming the signatories to the guarantee on the Bank's letter head.

The Tata Power Co Ltd

34,Sant Tukaram Road

Carnac Bunder,

Mumbai 400 009

Whereas (Name of the Contractor), a Company incorporated under the Indian Companies Act 1956, having its Registered office at _____, (hereinafter called the "BIDDER") has in response to your Invitation to Bid against Enquiry No. _____dated _____, for (name of work), offered to supply and/or execute the works as contained in Employers letter dated _____.

AND WHEREAS BIDDER is required to furnish to you a Bank Guarantee for the sum of Rs._____/-(Rupees ____ only) as Earnest Money against Bidder's offer as aforesaid.

AND WHEREAS we, (name of the bank) having our Registered Office at _____and Branch office at _____, have at the request of Bidder, agreed to give you this Guarantee as hereinafter contained.

NOW THEREFORE, in lieu of earnest money deposit, we, the undersigned, hereby covenant that the aforesaid Bid of the BIDDER shall remain open for acceptance by you during the period of validity as mentioned in the Bid Document or any extension thereof as requested by you and if Bidder shall for any reason back out, whether expressly or impliedly, from this said Bid during the period of its validity or any extension thereof as aforesaid, we hereby guarantee to you the payment of the sum of Rs._____/- (Rupees ____ only) on demand and without demur and notwithstanding the existence of any dispute between you and the BIDDER in this regard and we hereby further agree as follows:

(a) You shall have the right to file/make a claim on us under the Guarantee for a further period of six months from the said date of expiry.

(b) That this guarantee shall not be revoked during its currency without your written express consent.

(c) That you may without affecting this guarantee grant time or other indulgence to or negotiate further with BIDDER in regard to the conditions contained in the said Bid document and thereby modify these conditions or add thereto any further conditions as may be mutually agreed upon between you and BIDDER.

(d) That the guarantee hereinbefore contained shall not be affected by any change in the constitution of our Bank or in the constitution of BIDDER.

(e) That any account settled between you and BIDDER shall be conclusive evidence against us of the amount due hereunder and shall not be questioned by us.

(f) That this guarantee commences from the date hereof and shall remain in force till BIDDER, if his Bid is accepted by you, furnishes the Contract Performance Guarantee as required under the said specifications and executes formal Contract Agreement as therein provided or till ____Days (__days) from the date of submission of the Bid by the BIDDER i.e. (expiry date), whichever is earlier.

(g) That the expression, BIDDER and Bank, and OWNER herein used shall, unless such an interpretation is repugnant to the subject or context, include their respective successors and assignees.

(h) Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs._____/-(Rupees _____only) and the Guarantee will remain in force upto and including and shall be extended from time to time for such period or periods as may be desired by you. Unless a demand or claim under this Guarantee is received by us in writing within six months from (expiry date), i.e. on or before (claim period date), we shall be discharged from all liabilities under this guarantee thereafter.

(i) Any claim/extension under the guarantee can be lodgeable at issuing outstation bank or at the Mumbai branch and the claim will also be payable at Mumbai Branch. **(To be confirmed by Mumbai Branch by a letter to that effect)**

Notwithstanding anything contained herein above:

a) Our liability under this Bank Guarantee shall not exceed Rs._____/-(Rupees _____ only).

b) This Bank Guarantee shall be valid upto ---------- 200.

c) Our Liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this Bank Guarantee only and only if you serve upon us a written claim or demand on or before ---------- 200.

For any correspondence in relation to extension/invocation / discharge of bank guarantee

contact us at Tel No._____ and Bank branch email id_____

Section A7 : SAMPLE FORMAT OF CONTRACT PERFORMANCE BANK GUARANTEE (CPBG) / PERFORMANCE BANK GUARANTEE

Note: a) Format shall be followed in toto

b) Claim period of six months must be kept up

c) The guarantee to be accompanied by the covering letter from the bank confirming the signatories to the guarantee on the Bank's letter head.

The Tata Power Co Ltd

34,Sant Tukaram Road

Carnac Bunder,

Mumbai 400 009

Our Letter of Guarantee No.....

Contract/Purchase Order No.....dated.....

1.0 You have entered into a Contract No..... with..... .....(hereinafter referred to as " the Vendor") for the supply and delivery of ..... (Hereinafter referred to as "the said equipment") for the price and on the terms and conditions contained in the said contract.

2.0 In accordance with the terms of the said contract, " the Vendor" has agreed to furnish you with an irrevocable and unconditional bank guarantee in a form and from a bank acceptable to you as security for the due performance by " the Vendor" of all his contractual obligations under the said contract in an amount equal to 10% (ten percent) of the total value of the contract to be valid

from the date of contract and up to 12 months from the date of satisfactory commissioning of the said equipment into service or 18 months from the date of delivery whichever is earlier.

3.0 In consideration thereof, we, ... hereby irrevocably and unconditionally guarantee to pay to you on demand and without demur and without reference to " the Vendor" such amount or amounts not exceeding the sum of Rs.....(Rupees ..... only) being 10% (ten percent) of the total value of the contract on receipt of your intimating that " the Vendor" has not fulfilled his contractual obligations. You shall be the sole judge for such non-fulfilment and " the Vendor" shall have no right to question such judgement.

4.0 You shall have the right to file/make your claim on us under the guarantee for a further period of six months from the said date of expiry.

5.0 This guarantee shall not be revoked without your express consent and shall not be affected by your granting time or any other indulgence to " the Vendor", which shall include but not be limited to, postponement from time to time of the exercise of any powers vested in you or any right which you may have against " the Vendor" and to exercise the same in any manner at any time and either to enforce or forbear to enforce any covenant contained or implied in the said contract or any other course or remedy or security available to you, and our Bank shall not be released from its obligations under this guarantee by your exercising any of your rights with reference to matters aforesaid or any of them or by reasons of any other act or forbearance or other acts of omission or commission on your part or any other indulgence shown by you or by any other matter or thing whatsoever which under the law would, but for this

provision, have the effect of relieving our bank from its obligation under this guarantee.

6.0 We also agree that you shall be entitled at your option to enforce this guarantee against our bank as a principal debtor, in the first instance, notwithstanding any other security or guarantee that you may have in relation to " the Vendor" 's liabilities in respect of the premises.

7.0 This guarantee shall not be affected by any change in the constitution of our Bank or " the Vendor" or for any other reason whatsoever.

8.0 Any claim/extension under the guarantee can be lodged at issuing outstation branch or at Mumbai branch and also become payable at our issuing outstation bank or at the Mumbai branch as per confirmatory letter/letters of the concerned bank branches as attached. (This Confirmatory letter is to be obtained from Mumbai Branch by the vendor and submitted along with the Performance Bank Guarantee and is applicable for PBG submitted from Banks located outside Mumbai).

9.0 Notwithstanding anything herein contained, our liability under this guarantee is limited to Rs..... (Rupees .... only) and the guarantee will remain in force up to and including .....(Date) and shall be extended from time to time for such period or periods as may be desired by " the Vendor" .

10.0 Unless a demand or claim under this guarantee is received by us in writing within six months from ..... (expiry date) i.e. on or before .....(claim period end date) we shall be discharged from all liabilities under this guarantee thereafter.

11.0 For any correspondence in relation to extension / invocation / discharge of bank guarantee contact us at Tel No._____and Bank branch email id_____

Dated at ..... , this ..... day of .....2020 .

Supplier Code of Conduct

Tata Power follows the Tata Code of Conduct (TCoC) and the Whistle blower Policy and expect all its Suppliers to adhere to the same principles. **"Supplier"** here means any business, company, corporation, person or other entity that provides, sells or seeks to sell, any kind of goods or services to Tata Power, including the Supplier's employees, agents and other representatives. The suppliers are expected to adhere to the following Do's and Don'ts:

Do's

1. The Suppliers shall be committed to supplying products and services of high quality that meet all applicable standards and laws, including product packaging, labelling and after-sales service obligations.
2. Comply with all applicable laws and regulations, both in letter and in spirit, in all the territories in which it operates.
3. Strive to provide a safe, healthy and clean working environment for its employees.
4. Strive for environmental sustainability, particularly with regard to the emission of greenhouse gases, consumption of water and energy and the management of waste and hazardous materials.
5. The Supplier shall represent our company (including Tata brand) only with duly authorised written permission from our company.
6. Safeguard the confidentiality on the use of intellectual property, information and data of the Company.
7. Gifts and hospitality given or received should be modest in value and appropriate as per Company Policy.
8. The assets of Tata Power shall be employed primarily and judiciously for the purpose of conducting the business for which they are duly authorised.
9. All actual or potential conflicts due to financial or any other relationship with a Tata Power employee shall be disclosed.

Don'ts

1. The Supplier shall not make unfair or misleading statements about the products and services of competitors.
2. Children shall not be employed at workplaces.
3. Forced labour shall not be used in any form.
4. The Suppliers shall neither receive nor offer or make, directly or indirectly, any illegal payments, remunerations, gifts, donations or comparable benefits that are intended, or perceived, to obtain uncompetitive favours for the conduct of its business with Tata Power.

Reporting Violations

The Supplier shall notify the Company regarding any known or suspected improper behaviour of other suppliers or employees relating to its dealings with Tata Power, by email to: cecounsellor@tatapower.com.

The same can also be raised through our 3rd party ethics helpline facility:

1. Email id: tatapower@ethics-line.com ; Website: www.tip-offs.com
2. Helpline numbers: Toll free - 0008001004382 and 0008001008277. Also accessible at normal domestic call rates within India: +91-11-71279005
3. Postal address: Deloitte Touche Tohmatsu India LLP
   c/o Arjun Rajagopalan, Partner (Ethics Helpline Services)
   19th Floor, 46 - Prestige Trade Tower, Palace Road,
   High Grounds, Bengaluru, Karnataka – 560001