RFQ No.: CC24VKD001

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.: CC24VKD001

Due Date for Bid Submission: 12.08.2023 [17:00 Hrs.]

The Tata Power Company Limited
Mumbai, Maharashtra

RFQ No.: CC24VKD001

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-Year Outline Agreement 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 03.08.2023. 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 26.07.2023 to 12.08.2023, 17:00 Hrs
(b)	Date & Time of Pre-Bid Meeting (If any)	NA
(c)	Last Date of receipt of pre-bid queries, if any	7.08.2023 up to 17:00 Hours
(d)	Last Date of Posting Consolidated replies to all the pre-bid queries as received	9.08.2023 up to 17:00 Hours
(e)	Last date and time of receipt of Bids	12.08.2023 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

Pre- Qualification Criteria - Annexure A

Package Description : Supply and Integration of 1 Lakh Smart Meters with Head End System and Meter Data Management System			
Tender Reference no : CC24VKD001			
Pre-Qualification Requirement (PQR) - Please note that the PQR is for information only and the documentary evidence to ascertain meeting of the requirement has to be submitted			
Sr No	**Parameter**	**Tata Power Requirement**	**Documents to be submitted by Bidder**
A	Options for Bid submission		
		The bidder may be either the Original Meter Manufacturer (OEM) OR System Integrator (SI) OR Consortium of Meter Manufacturer & System Integrator. Joint Venture Companies can also participate. Bidder should meet qualifying requirements stipulated in any one of the qualifying options i.e.	Bidder to submit the Consortium Agreement.
		1. **Option 1** - **A.** Meter Manufacturer and System Integrator through Consortium. Here, the Meter Manufacturer shall meet all the criteria for Meter Manufacturer and the System Integrator shall meet the criteria for System Integrator. Only the Meter Manufacturer has to be the lead Bidder. The overall liability of execution of the contract shall lie with Lead Bidder. In addition to above , the criteria mentioned in General Pre-Qualification requirements shall also met. OR **B.** Meter Manufacturer on Stand -Alone basis, wherein the meter manufacturer meets the Pre-qualification requirement for Meter Manufacturer and System Integrator, both. In addition to above , the criteria mentioned in General Pre-Qualification requirements shall also met OR System Integrator on Stand -Alone basis , wherein the system integrator meets the Pre-qualification requirement for Meter Manufacturer and System Integrator, both. In addition to above, the criteria mentioned in General Pre-Qualification requirements shall also met	
		3. Option 2 - In case Tata Power opt for only design & supply of smart meter then 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.	
B	**General Pre-Qualification Requirements (applicable to Meter Manufacturer and System Integrator)**		
1		The Bidder/ Lead Bidder (in case of consortium) 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. 300 Crores** for the last three financial years ending 31st March 2023.	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
		[In case of consortium, the average annual turnover of Lead bidder and Consortium partner shall be considered separately to meet the above requirement]	
C	**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 the 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 original bid submission date.	Individual Client's PO/ WO/ LOI/ LOA/ Contract/ Certification on client letterhead. Performance certificate and contact details of clients needs to be submitted
2	ISI Certification.	Smart Meters offered shall have Certification for 'ISI marking as per IS:16444 with latest amendment. The certification should be valid on the date of Tender opening.	A copy of Certificate for the Smart Meter offered should be furnished.
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 the manufacturing capacity of smart electricity Meters. All the below criteria are to be fulfilled- • Minimum of 2 Lac Single Phase Smart Meters per annum and • Minimum 1 Lac Three Phase Smart Meter per annum. • Minimum 10,000 LTCT Smart Meter per annum.	Proof of Work order & performance certificate/ work order completion certificate to be submitted.
5	Quality	The vendor should have valid ISO9001 & 14001 for the manufacturing facility.	ISO Certificate.
6	Experience of Tata Power existing HES	Vendor-supplied Meter should be able to work with TPC existing Smart Meter UHES and or MDM based on the solution.	Self-undertaking by the Bidder regarding the integration with existing HES of Tata Power.
D	**Pre-Qualification Requirements for System Integrator (SI)**		
1	Annual Turnover	Minimum Average annual turnover of Rs. 50 Crores for the last three financial years ending 31st March 2023.	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
2	Technical Experience - System Integrator (SI)	System Integrator must have successfully executed AMI projects (Consists of Smart Meters, DCU/Gateway/Router/ GPRS Access Point, and HES) with a cumulative installation base of Minimum 2 Lac endpoints in the last 5 years till the date of publication of this tender.	Client's PO/ WO/ LOI / LOA/ Contract/ Certification on client Letterhead / Performance certificate and contact details of clients.
3	Technical Experience - HES	The HES provider must have the following deployment capabilities in National/International Utilities.All the below criterias are to be fulfilled- Successfully Commissioned cumulative 5 Lac or more end points in AMI projects. Single Large AMI deployment experience of at least 2 Lac meters on cellular or RF. At least 3 different meter brands operating on single network and Head End System. Successful integration of HES with at least 3 MDMS system OEM. The AMI project should have been in successful operation for last one year.	Purchase order/Completion/ Go-live certification from a client. Client certificate (with contact details) for supply and successful operation of the Head End System. Tata Power reserves the right to contact/visit such client during the evaluation of this tender response.

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 the overall all-inclusive lowest cost based on Option (1,2,3) recommended 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

" 3-Year Outline Agreement for Revenue Recovery Assurance activities for Tata Power Mumbai.."

Please mention our Enquiry Number:- CC24VKD001 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

3 years from the date of award of OLA.

7.4 Warranty Period

As per Specifications / Job Scope

7.5 Payment Terms as per Annexure B

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.

Payment Term Annexure B

The Payment terms shall be as follows:

Submission of 10% CPBG within 15 days from date of OLA valid till the Completion of the warranty period (Last lot of meters) with a further claim period of 6 months.

Supply Smart Meters
80% of on pro-rata basis on receipt of material at 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.

IT System, Software and Licenses
Server Infrastructure (Supply)
80% of on a pro-rata basis on Supply of material at site (with 100% taxes and duties)
20% Payment on a pro-rata basis after integration and successful receipt of meter data in SAP Billing System (for the first lot of 1000 meters) for 3 months

HES (Supply) with License
80% of on pro-rata basis on Supply of material at site (with 100% taxes and duties)
20% Payment on a pro-rata basis after integration and successful receipt of meter data in MDM System for first lot of 1000 meters) for 3 months.

Credit period of all line items (except for Communication charges) will be 90 days.

For all line items where payment is linked to flow of data to Tata Power SAP system, in case of delay due to the Integration of API with SAP billing system by Tata Power, then Tata Power will make payment within 15 days with respect to actual

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.

ANNEXURE I

Price Bid format:

Option 1 (A,B) (Bidder may come with new HES)

A	**Supply of Smart Meters with NIC**	**UOM**	**Qty**	**Cost**	**Total Value in INR(w/o tax)**
1	Single Phase 10-60A Whole Current Smart Meter with NIC	EA	72,000		
2	Three Phase 10-100A Whole Current Smart Meter with NIC	EA	25,000		
3	Three Phase -/5A LTCT Smart Meter with NIC	EA	2,950		
4	Three Phase HTCT Smart Meter with NIC	EA	50		
5	HES Cost with perpetual license for 1,00,000 meters	EA	1		
6	Server infrastructure and networking	EA	1		
	Total Baisc Value				0
	GST @18%				
	Total all Inclusive Value with GST				

Option 2 (Bidder has to integrate meter in Tata Power existing HES & MDMS system)

A	Supply of Smart Meters with NIC	UOM	Qty	Unit Price	Total Value in INR(w/o tax)
1	Single Phase 10-60A Whole Current Smart Meter with NIC	EA	72,000		-
2	Three Phase 10-100A Whole Current Smart Meter with NIC	EA	25,000		-
3	Three Phase -/5A LTCT Smart Meter with NIC	EA	2,950		-
4	Three Phase HTCT Smart Meter with NIC	EA	50		-
5	Server infrastructure and networking	EA	1		-
	Total Basic Value				0
	GST @18%				
	Total all Inclusive Value with GST				

- ☐ 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. 4 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

Table of Contents:

Abbreviations:

AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
BoQ	Bill of Quantities
DLMS	Device Language message specification

FAT	Factory Acceptance Test
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HES	Head End System
IEC	International Electro technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
MDMS	Meter Data Management System
OEM	Original Equipment Manufacturer
SAT	Site Acceptance Test
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
VLAN	Virtual LAN
WAN	Wide Area Network
WPC	Wireless Planning & Coordination Wing
NCIIPC	National Critical Information Infrastructure Protection Center
MDMS	Meter Data Management Solution
ISU	SAP - Industry Solution for Utilities
R3	SAP ERP
BI	Business Intelligence (SAP - Business Warehouse/ Business Objects)
BW	SAP - Business Warehouse
MCF	SAP - Multi Channel Foundation (Customer Portal)
CRM	SAP - CRM Module
ESB	Enterprise Service Bus
PI	SAP - Process Integrator
SMRD	Smart Meter Reading Device
OMS	Outage Management system
ADMS	Advance Distribution Management System
GIS	Geographical Information System
TOU	Time of Use
VEE	Validation, Editing, Estimation

1 Smart Meter Project at Tata Power Mumbai

1.1 Background

Tata Power - Distribution is engaged in retail supply of electricity across Mumbai Licensed area. The total spread of the licensed area is 485 Sq. Km. covering the main city of Mumbai & its suburbs and houses a population of approximately 1.45 crores. Presently Tata Power has a consumer base of about 7.5 Lac which includes HT & LT Industrial, Commercial and Residential consumers. This RFP is being floated for inviting tender for Supply and Integration of Smart Meters with Head End System and Meter Data Management system for the consumers of Tata Power.

The supply under the RFP would cover 1,00,000 Smart Meters which would include Single Phase, Three Phase, LTCT and HT Smart Meters.

1.2 Brief Scope of Work

Bidder shall study the existing system of Tata Power and offer End to End Smart Metering Solution comprising of Design, Planning, Engineering, Supply, Integration, Testing, Commissioning, MIS preparation, documentation, and Facility Management Services (FMS) (for 1,00,000 Smart Meters of different types (referred to as 'Tata Power Smart Meter Project' here onwards).

The detail scope is given below:

1.2.1 Bidder shall study the existing system of Tata Power, basis on that design and offer Smart Metering solution.

1.2.2 Bidder shall Design, Supply and Integrate the Smart Meter with any of the following technology-based Network Interface Card (NIC)—

- 4G with fall back on 2G.
- NB-IoT with fall back on 2G.
- PLC+RF (Hybrid).

1.2.3 Bidder shall design, supply, install necessary IT hardware required for installation of HES & MDMS applications, database and any other software required to establish smart meter solution.

1.2.4 Bidder shall design, supply, provide the perpetual lifetime license of 1,00,000 metering points, carry out AMC and FMS of the Head End system (HES) and Meter Data Management System(MDMS).

1.2.5 Setting up Head-End System, Meter Data Management System, and integration with Smart Meters and various other existing IT/OT systems of TATA POWER.

1.2.6 Bidder shall carry out FMS for a period of 7 years without any additional cost implication. It includes maintaining the entire AMI System field and backend infra (Managing & settling the communication charges, carry out AMC and FMS of the Head End system (HES) and Meter Data Management System(MDMS) along with all required IT infrastructure, maintaining, and ensuring the proper functioning of Smart Meters communication devices in field, ensure the updated patches, Government guidelines and cyber security guidelines issued time to time.

1.2.7 Bidder shall demonstrate the integration of meter with HES and Smart Meter functioning as per IS standards as part of technical evaluation.

1.2.8 The system deployed in the TATA POWER Smart Meter Project shall have the latest functionality using updated technology, it shall have high reliability, low failure rate of meters and future proofing for at least up to 7 years from the date of commissioning.

1.2.9 Bidder shall carry out the end-to-end integration of different meter OEMs in the supplied backend system.

1.2.10 Bidder shall include, in complete conformity with the technical and financial bid as mentioned in this contract as well as AMI system requirements and Service Level Agreements as mentioned in this Contract and Applicable Laws.

1.2.11 Bidder shall include application performance monitoring solution with applicable metrics for entire HES & MDMS.

1.2.12 Bidder shall be able to supply dual source (single phase, three phase WC, LTCT) smart meter within a period of 1 year from date of this PO. Separate order will be placed to procure the same.

1.3 Key activities

1.3.1 Design, Engineer, Supply, Commissioning of Smart Meters having Network Interface Card (NIC) with any of the following technology---

- 4G with fall back on 2G.
- NB-IoT with fall back on 2G.
- PLC+RF (Hybrid).

1.3.2 Design, Supply, Commissioning, and license of Head-End System (HES) and Meter Data Management System (MDMS).

1.3.3 The AMI system should be designed such that all the required hardware, software, and firmware with upgrades satisfy the AMI system requirements and service level agreements as specified in this Contractwhile considering technical obsolescence over the operating life of the system and suitability for futurescale up. However, the entire responsibility of fully functional AMI system shall rest with the bidder to meet the performance levels as given in the Contract. The Bidder shall ensure that the Solution complies with the Applicable Law, technical specifications, and other provisions of the Contract.

1.3.4 The systems under TATA POWER Smart Metering Project and associated equipment should be capable of initially handling around 0.1 million number of end points scalable upto minimum 1 million end points over next few years.

1.3.5 Bidder will submit bid for 0.1 mn end points but the system upscaling provision to a level of min of 1 million shall be available and bidder must declare maximum scalability.

1.3.6 TATA POWER envisages to operate certain quantity of Smart Meters as Pre-paid Smart Meters. These includes single phase & three phase WC meters. The system supplied by the Bidder has to seamlessly perform at the highest level with both pre-Paid and post- paid meters. The mix of these two types would continue to vary throughout the project life cycle and the meters category may also change from pre to post or post to pre through remote.

1.3.7 The Bidder need to supply system which would have full functionality to operate Smart Meters in pre-paid mode including identification of such meters, various modes of accepting payments and recharging the Smart Meters, tariff configuration from remote, billing based on consumption monitoring on real time basis, creating & sending alerts to consumer for top up etc., bill on demand and other features which would be latest in the sector. Successful Integration / Interface of the Smart Metering system with the existing and any future systems implemented by TATA POWER, within contract period with the business applications proposed by the Bidder.

1.3.8 All integration between proposed AMI system and other systems of TATA POWER should be based upon SOA methodology. The successful bidder's responsibility w r t integration with other TATA POWER's systems would remain limited to the development/modification related to Bidder's own system (including but not limited to API design, API, development, API consumption, integration testing). However successful bidder shall be responsible for jointly defining integration approach, methodology and design.

1.3.9 Integration of AMI data with consumer mobile application of TATA POWER.

1.3.10 Maintain the system including HES, MDMS, any other required infrastructure to keep the system working at full functionality. Bidder is required to pay for all the cost arising for the same.

1.3.11 Vendor must submit VAPT Audit report of Application version from Cert-In empaneled auditor. Cert-In impaneled auditor agency list to be provided by Tata Power.

1.3.12 Vendor must conduct once a year VAPT audit without any additional cost implication.

1.3.13 Any new build version to be deployed after VAPT closures.

1.3.14 Adhering to all the parameters defined in SLA.

1.3.15 Arrange visit to the site for the integration and all the functionalities of Smart Meter system.

1.3.16 Training and knowledge transfer.

1.3.17 Bidder should be 'end to end' responsibility of Supply, Installation, and management of hardware.

1.3.18 Hardware support should be for 7 years.

1.3.19 Operation system management, Patch management, Backup management should be optional part of solution – TPC has right to select.

1.3.20 Any VAPT conducted by Tata Power – Supplier has responsibility to close all the observation for OS / Application levels.

1.3.21 System design, Architecture & Data flow document should submit as part of project closure.

1.3.22 Performance benchmark should be conducted before 'go live' of application.

1.3.23 Supplier should be responsible for any supply of Network / Security devices respected to solution.

1.3.24 Hardware firmware upgradation is in supplier's scope during the period of AMC.

1.4 The Project Quantity

1.4.1 The Project envisages supply of 1,00,000 Smart Meters over a period of one years.

1.4.2 HES and MDMS system installation and integration will be completed before the meter delivery.

1.4.3 Approximate meter type wise breakup of meter quantity is as given below.

Line Item	**Tender description**	**UoM**	**Total Quantity**
1	Supply of Single-Phase Smart Energy Meter	EA	72,000
2	Supply of Three Phase Whole Current Smart Energy Meter	EA	25,000
3	Supply of Three Phase LTCT Smart Energy Meter	EA	2,950
4	Supply of Three Phase HT Smart Energy Meter	EA	50
	TOTAL		**1,00,000**

Note: -

- Tata Power reserves right to procure additional Smart Meters of different types at the final agreed rate over and above the quantity mentioned above. Tentative date wise delivery schedule is given below—

Expected Delivery Date	1P	3PWC	LTCT	HT	Grand Total
01.11.2023	15,000	3,000			
01.12.2023	10,000	3,000		50	
01.01.2024	10,000	5,000	500		
01.02.2024	10,000	3,000	500		
01.03.2024	6,000	4,000			
Total FY24	**51,000**	**18,000**	**1,000**	**50**	**70,050**
01.04.2024	7,000	2,000			
01.05.2024	7,000	2,000	500		
01.06.2024	7,000	3,000			
01.07.2024			1,450		
Total FY25	**21,000**	**7,000**	**1,950**	**-**	**29,950**
Grand Total	**72,000**	**25,000**	**2,950**	**50**	**1,00,000**

- Tata Power reserves the right to change the scope/exclude some of the components at the time of final order placement.
- Tata Power may split the order quantity to more than 1 bidders.

2 Smart Meters

2.1 Smart meters will have to be supplied as per the specifications of Tata Power Mumbai.

2.2 Following types of Smart Meters are to be supplied

- Single Phase Smart Meters
- Three Phase Whole Current Smart Meters
- Three Phase LTCT Smart Meters
- Three Phase HTCT Smart Meters

2.3 Smart Meter shall have the following minimum basic features (but not limited **to)**

- Valid BIS certification.

- Plug-in Type Bidirectional Communication module / Network Interface Card (NIC) with suitable sealing arrangement on 4G fallback to 2G or NB-IoT to 2G or PLC+RF (Hybrid).
- The Plug-in module shall be field Hot Swappable with any type of communication module such of similar cellular WAN technology. Smart Meter shall have the dedicated slot with suitable power arrangement which will accommodate any type of Communication Module/ Network Interface Card without the need to replace entire meter. (The bidder shall be able to demonstrate this feature i.e., Same Meter can work on multiple technology NIC).
- 4G/NB-IoT NIC shall have facility of auto fall back to 2G networks.
- Integrated Load Limiting Switch / Relay.
- Pre-Paid Functionality.
- Net Metering Feature (Import/Export Energy Measurements).
- Tamper event detection, recording and reporting.
- Terminal Cover Open with “time stamp” registration at no power
- Power event alarms such as Loss of Supply, Low/ High Voltage, Phase Unbalance, Remote Firmware Upgrade, On Demand Reading Support to be provided to upgrade to future advancement of technology like 5G/6G.

2.4 Bidder shall provide all the support for Up-gradation / Modification of Firmware.

2.5 The bidder shall ensure the possibility of up-gradation of the Firmware / software in the communication modules/Smart Meter from remote.

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

2.7 Offered solution to comply with all govt notifications in force as on date of order placement. Bidder should also support in complying the latest govt notifications issued time to time within speculated timelines provided by govt.

2.8 Smart Meter should display signal strength/ network type/ communication status on display for quick analysis and shall have the facility to send the same to HES.

2.9 Bidder should supply the Smart Meter as per the Tata Power Data Model. Bidder should support with firmware changes and obis code development to meet the requirement of Tata Power.

2.10 Any firmware change required due to regulatory or statutory body requirement will be done by bidder on priority basis to meet the timeline throughout the life cycle of meter.

2.11 Meter should support configuration of APN, Push IP, Load limit & current limit (enable-disable, threshold settings, timing settings etc), configuration change(prepaid configs, TOD configs., load survey, demand period time, MD reset, RTC etc.) from remote and local. Bidder to also provide local application for the same.

3 Communication System

3.1 General requirement for communication system

3.1.1 The Network Interface Card (NIC) shall be 4G connectivity fall back to 2G or NB-IoT fall back to 2G or PLC+RF(Hybrid).

3.1.2 It will be sole responsibility of bidder to ensure 24X7 connectivity between Smart meter and HES and ensure the integration between HES and MDMS.

3.1.3 NIC Cards to be supplied with e-SIM. Bidder is required to demonstrate the communication through e-SIM of various profiles. as a part of tender evaluation.

3.1.4 Supplied e-sim shall support multiple profile. Change of NSP option from remote.

3.1.5 Entire system should be designed by bidder to ensure that all network elements of the proposed solution comply to the WPC/any other Govt. regulatory and security guidelines. The offered solution should have minimum life cycle cost and should perform as per the defined SLA.

3.2 Functional requirements of Network Interface Card (NIC)

3.2.1 NIC shall be interoperable at smart meter level of multiple make and model. Also, the NIC shall be vendor and service provider agnostic.

3.2.2 Bidder to supply suitable communication system as described above to ensure appropriate primary and fallback arrangement for data flow from Smart meter till the HES.

3.2.3 NIC shall support two-way communications between smart meter & head-end system such as data exchange, configuration parameters exchange, alarms, operational commands, firmware upgrade of the meter as defined in IS16444 and IS15959 (With latest amendments).

3.2.4 NIC shall support push services, alarms services of the smart meter as defined in IS16444 and IS15959 (With latest amendments).

3.2.5 NIC shall also support on-demand / schedule reading, connect / disconnect, time sync, configuration and over the air firmware upgrade from the head-end system.

3.2.6 NIC card shall support remote Device Management Capability such as Reset, Configuration, Log Check, Ping, and over the air Firmware upgrade

3.2.7 NIC shall have persistent network connectivity throughout as defined by 4G/NB-IoT/ PLC+RF(Hybrid) standards. It shall support self-configuring and self-healing features.

3.2.8 NIC shall operate 24*7 and shall recover from any deadlock situation in the field immediately.

3.2.9 NIC shall register with network i.e. login and logout of each terminal to the HES. It shall be recognized in the HES as authorized node.

3.2.10 Attributes such as Firmware version, Hardware version, Signal strength values, packet error rate, should be pushed periodically to HES for effective communication management.

3.2.11 NIC shall support standard security protocols.

3.2.12 NIC shall be compliant with cyber security norms.

3.2.13 Data must be encrypted with AES-256 bit or higher level.

3.2.14 Support for provision of a unique certificate/key in each card for mutual authentication with the HES from security point of view.

3.2.15 Supplied NIC should support all the operational cellular bands of all Telecom Service

3.2.16 Providers operating in Country on the date of award of PO.LED indication for System, Power ON indicator.

3.2.17 Color coded LED (a) For latching on to the network (b) For latched on to the network (c) For data flow indication.

3.2.18 Supplied Smart Meter along with NIC card should be ready to handle the future advancement of communication technology like 5G. It should be possible through NIC change/firmware update/ configuration change without replacing meters.

3.2.19 Appropriate software/ tools with lifetime license to be provided for internal troubleshooting of NIC & Device Level Issues. Training of same to be given to Tata Power personal without any cost implications.

3.2.20 Bidder shall undertake the sim card supply and configuration as per prevalent Tata Power cyber security policy.

3.2.21 NIC shall display the self-diagnostic error codes on display. It shall also be capable to send the details like network type, IMEI, Sim Number, IP address to HES through customized OBIS codes.

4 Universal HEAD END SYSTEM (HES)

4.1 General requirements of HES

4.1.1 HES will be supplied and maintained by bidder. The main objective of Head End System (HES) is to acquire meter data automatically without any human intervention and monitor parameters received from the meters. The HES stack involves provision of Comprehensive Software Solution and Integration for secure two-way communication with each Smart Meter for Meter Data Acquisition, Monitoring & Control and Report generation.

4.1.2 The communication interface of HES shall be telecom service provider agnostic and support various communication technologies. It should support various types of communication technologies like 2G/4G/5G/NB-IoT/ PLC+RF(Hybrid).

4.1.3 HES shall be designed to work in a 'Main' and 'Standby' mode wherein two instances of the software will be running on different physical systems at different locations with the 'Standby' assuming functionality in the event of failure of the 'Main' system.

4.1.4 Also, the HES software should support Active/Active mode through server load balancer.

4.1.5 HES shall be designed to handle all billing registers which are required for caring out billing of different categories of consumers as per latest tariff and support tariff register change process.

4.1.6 TPC can also decide to integrate another make MDMS's with the bidder supplied HES. Bidder shall provide all the required support for integration of the same.

4.1.7 It shall support handling of data polling at different interval on the basis of rate category.

4.1.8 HES shall be developed on open platform based on distributed architecture for scalability without degradation of the performance. HES shall support storage of raw meter data, alarms, and alerts for a period of minimum 2 years. Adequate database and security features for storage of data at HES need to be ensured.

4.1.9 HES shall be capable of handling around 0.1 million end points initially and shall be scalable to 1 million end points in future.

4.1.10 Current Licenses procurement would be for 0.1 million consumers and should be on perpetual basis with 7 years of warranty from date of purchase. Bidder shall also provide any software updates, upgrades, patches released without any additional cost during warranty.

4.1.11 The HES shall have the Authentication, Authorization and Accounting module. The HES security mechanisms and communication protocols shall be based on open standards. The entire solution shall be based on generic IPv6 from end-to-end. The system shall be designed with complete focus on security and data integrity.

4.1.12 The communication solution must be scalable in volume and the HES shall have built-in reserve capacity to allow memory and processes to be upgraded with new functionality over time.

4.1.13 HES software development / configuration works should be on development server with access to Tata Power to oversee the work and the complete source code of HES software should be handed over to TATA POWER.

4.1.14 HES should be designed to handle all billing registers which are required for caring out billing of different categories of consumers as per MERC tariff.

4.1.15 All future update in billing should be developed and updated in HES within 7 days' time.

4.2 Functional Requirement of HES

4.2.1 Device Management

4.2.2 HES shall have the ability to synchronize with the meter master data available in MDMS as the meters are installed, replaced, or removed and validate the correct configuration and operation of the meters.

4.2.3 HES shall support self-discovery functionality to detect new and replaced meters within 60 minutes of meter powered ON and establishment of communication.

4.2.4 HES shall have the ability to automatically maintain the master table comprising of the mapping between meter serial number, NIC serial number, SIM number and IP address, firmware version. The master table shall be auto updated if any NIC card, SIM cards, firmware are changed at field.

4.2.5 HES shall have the ability to categorize the meter under various drop-down menus like zone / substation / feeder / DT / Consumer category (HT / C&I, Domestic, Net meter, Open access).

4.3 Communication with Smart Meter

4.3.1 HES shall have the ability for a two-way communication with the smart meter.

4.3.2 The communication interface of HES shall be Telecom Service Provider agnostic and the ability to support hybrid communication technologies viz NB-IoT / 4G / 2G/ PLC+RF(Hybrid) based on field conditions.

4.3.3 HES shall have the ability to adopt pull mechanism to acquire meter data for scheduled reads and on demand reads. It should also support the push mode to capture all the data if required.

4.3.4 Shall have the ability to simultaneously communicate and process the data till front end for 1 lakh meters and acquire meter reads of 15 minutes interval on pull mechanism of last 45 days data before the next 15-minute interval.

4.3.5 HES shall have the ability to define flexible period for the scheduled meter reads depending upon the class of meter. TATA POWER shall dynamically decide the frequency (5min, 15 min etc) for scheduled meter read and the HES shall have the ability to support this service.

4.3.6 HES shall be capable of defining the activities to be performed such as reading the meter, performing authenticated transactions or configuring the field device, the specific meters to be read (selectable by different filter criteria such as area, device type). Should be capable of scheduling tasks to be performed at defined time with recurrence criteria.

4.3.7 Shall have the ability to handle special metering configurations like net metering and open access metering , pre-paid metering etc.

4.3.8 Shall have the ability to perform authenticated and secure transactions with all configured Smart meters.

4.3.9 Shall ensure data integrity checks viz. Checksum, Time check, Pulse, Overflow on all metered data.

4.3.10 Shall have the ability to accept input, process, store, and analyze billing meter data Register reads, Load profile, and Events / Alarms.

4.3.11 Shall have the ability to accept input, process, store, and analyze non-billing meter data such as voltage, current, power quality data .

4.3.12 Shall have the ability to manage 15 minute and 30-minute interval data for billing and non-billing parameters. These data shall be stored in HES for a maximum period of 24 months.

4.3.13 HES shall support meter energization checks (on-demand pings) by meter/customer or batch of meters/customers.

4.3.14 Shall facilitate issuing commands – from MDMS – to acquire specific, instantaneous, or historical data. The commands can be to individually selectable meters or a collection of meters (user defined) or all meters within a section / substation / feeder / DT. The HES shall have the ability to perform these tasks and respond the data back to the MDMS. The commands shall be typically (not limited to)

4.3.15 Meter reading (Load profile, registers, status flags)

4.3.16 Meter events / Alarms

4.3.17 Meter diagnostic (ping, load side voltage, switch status)

4.3.18 On demand readings (registers and load profile)

4.3.19 Meter connect / disconnect feature (for single phase and three phase whole current meter only)

4.3.20 Shall facilitate Over the Air firmware upgrades of smart meters individually or in groups.

4.3.21 Shall have the ability to issue command to meters to carry out the operations like NIC configuration changes, Firmware upgrades over the air, get current configuration, remote reset of communication module, set time and date of NIC and NIC change out process.

4.3.22 Shall have the ability to remotely diagnose and troubleshoot the communication module of the meter like no power to NIC, meter to NIC link status, NIC faulty, NIC hanged, NIC firmware not working

4.3.23 Shall have the facility to time synchronize all communication module once a week.

4.3.24 HES shall have provision for First Breath (Power On) and Last gasp (Power off) condition detection and communication with Smart Meters. HES shall provide these outage detection and power restoration notifications to MDMs on Realtime to support enhanced outage management.

4.3.25 Shall support the physical disconnect/reconnect functionality.

4.3.26 Shall support the load limiting functionality.

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

4.4 Meter Data Upload from CMRI and Mobile devices

4.4.1 Shall have the ability to integrate with various makes of CMRI and Mobile devices

4.4.2 Shall have the ability to upload billing and non-billing data brought from field through Handheld Units and Mobile devices in case the data is not available through automated meter reading.

4.5 Integration

4.5.1 Integration with MDMS

4.5.2 Shall have the ability to send the metering data in a specific format as required for integration with the MDMS.

4.5.3 Shall have the ability to respond to all the commands received from MDMS

4.5.4 Shall have audit trail functionality for managing and storing all the records of activities performed between HES and MDMS.

4.5.5 Integration with Telecom Service Provider

4.5.6 Shall have the ability to onboard Telecom Service Provider's M2M platforms for deriving the operation and management of SIM.

4.5.7 Shall facilitate SIM management like active SIMs, Suspended SIMs, Data consumed by each SIM

4.5.8 Shall have the ability to interface with TATA POWER E-mail gateway for SMS related services.

4.5.9 Shall have the ability to interface with TATA POWER SMS gateway for SMS related services.

4.5.10 Shall have facility for Business Process Integration though both synchronous and asynchronous methods. Bidder shall ensure development and support wrt integration to TATA POWER business processes as per its technology deployment roadmap.

4.5.11 HES shall support daily billing for EOB and Instantaneous read record.

4.6 Dashboard, Reports and Search functionality

4.6.1 Shall have the ability to generate real time dashboards zone wise / area wise for the following parameters (not limited to):

4.6.2 Count of total number of installed meters.

4.6.3 First breath and last gasp alarm.

4.6.4 Count of active meters.

4.6.5 Real time SLA report of all parameters. Historical SLA report.

4.6.6 Non communication meters count and probable reason of failure.

4.6.7 Count of online / offline / toggling meters (toggling meters are those meters that have intermittent connectivity). Online / offline counts over the last one week / one month

4.6.8 List of meters that have been installed but not communicating for a designated period.

4.6.9 History and audit trail for all data collected from meters including commands sent to meters.

4.6.10 Data availability and data non availability

4.6.11 No. of attempt failures, no. of retry attempts, failure to connect.

4.6.12 Quantum of daily data exchanged between HES and every meter

4.6.13 Search meter for configuration, raw files, event / alarms, load switch position

4.6.14 NIC change, SIM change

4.6.15 Signal strength at every meter during every read cycle.

4.6.16 Reports to measure relevant SLA parameters.

4.6.17 HES shall provide daily, weekly, and monthly performance reports tracking equipment failures, communications failures, and data latency for all customer and equipment classes.

4.6.18 Shall have the ability to visualize device wise / area wise power quality related information such as voltage, frequency, and harmonics.

4.6.19 Shall have the ability to categorize the meter under various drop-down menus like zone / substation / feeder / DT / Consumer category (HT / C&I, Domestic, Pre-paid, agricultural, Net meter, Open access) and depict the signal strength for user definable period.

4.6.20 Shall have the ability to predict meters that would fail to communicate basis the signal strength trend and the historical communication track record.

4.6.21 Shall have the ability to capture and log data exceptions, problems, and failures and to generate management reports, provide trend analysis, and track corrective actions.

4.6.22 Meter connect/ disconnect report shall be given. Where along with connect/ disconnect data readings at the time of connect/disconnect shall also be captured.

4.6.23 There should be option to extract all the reports in bulk in various format like Excel, pdf, csv, rtf, html of the end metering points. (Up to 1 lakh meters at once, over that option to download report in batches of 1 lakh meter)

4.6.24 Bidder shall develop 100 custom reports to be developed as per TPC requirement.

4.6.25 Detailed reporting requirements will be finalized and signed off during Blueprint documentation stage.

4.7 Cyber Security

The HES system shall have adequate cyber security measures as per TATA POWER security policy not limited to the measures as described below. Successful bidder shall do regular updation in system security as per updated TATA POWER security policy.

4.7.1 Secure Access Controls: The system shall include mechanisms for defining and controlling user access to the operating system environment and applications. Best practices from enterprise security including password strength, password ageing, password history, reuse prevention must be followed for access control.

4.7.2 Authorization Controls: A least-privilege concept such that users are only allowed to use or access functions for which they have been given authorization shall be available.

4.7.3 Logging: Logs must be maintained for all attempts to log on (both successful and unsuccessful),any privilege change requests (both successful and unsuccessful), user actions affecting security (such as password changes), attempts to perform actions not authorized by the authorization controls, all configuration changes, Additionally, the access to such logs must be controlled in accordance to the least-privilege concept mentioned above, so that entries may not be deleted, accidentally or maliciously.

4.7.4 Hardening: All unnecessary packages must be removed and/or disabled from the system. Additionally, all unused operating system services and unused networking ports must be disabled or blocked. Only secure maintenance access shall be permitted, and all known insecure protocols shall be disabled.

4.7.5 Malicious Software Prevention: Implementation of anti-virus software and other malicious software prevention tools shall be supported for all applications, servers, data bases.

4.7.6 Network Security: The network architecture of the HES must be secure with support for firewalls and encryption. The system shall also allow host-based firewalls to be configured, as an additional layer of security if the network firewall were to fail.

4.8 Security requirements

HES shall support the outlined data and system integration securities.

4.8.1 Secure upgrade process for hardware, software, communication messages and endpoint devices

4.8.2 Provide an authorization process to validate any individuals “right of access” to the system or subsequent control and monitoring screens.

4.8.3 Provide an environment sufficient to warrant the confidentiality of information to ensure that data is not exposed to unauthorized persons, processes (interfaces), and/or devices.

4.8.4 Should be annually subjected to penetration and other security audits from a reputable third-party security firm.

4.8.5 Role-based security for database and application administration, application operations and execution, ad-hoc read-only privileges.

4.8.6 Web-services / SOAP protocol and JMS integration requiring username

4.8.7 Support for mutual or 2-way authentication.

4.8.8 AES-256 (or better) bit encryption for persisting sensitive data at rest.

4.8.9 Key Store to manage certificates and access credentials.

4.8.10 SSL secured communications.

4.9 Technical requirements

4.9.1 Shall be scalable to include all meters and AMI communications points.

4.9.2 Shall support operating in a virtualized server environment.

4.9.3 Shall easily integrate to different applications using industry standard interfaces and shall comply with CIM / XML / IEC 61968/IS15959/ Indian Companion Specification/ any other open standard. HES solution shall be Service Oriented Architecture (SOA) enabled

4.9.4 Shall have sufficient data processing performance to support every 15-minute handling of data from 100 percent of the meters for minimum 45 days.

4.9.5 Bidder shall furnish the compatibility matrix of the Operating System (OS) for HES. The choice of OS shall be such that the HES application should functionally serve for 7 years. However, if the opted OS becomes obsolete and HES might not function on the new version of OS, the bidder shall provide a free upgrade & version compatible with the new OS.

5 Meter Data Management System:

5.1 MDMS System Requirements

5.1.1 MDMS will be supplied and maintained by bidder. The Meter Data Management System (MDMS) is the heart of AMI system. MDMS shall be a single repository of all meter data. The MDMS shall support storage, archiving, retrieval & analysis of meter data and various other MIS along with validation & verification algorithms.

5.1.2 Meter reading processing and developing billing determinant for Domestic, Industrial, Commercial, agricultural, Net Metering, Open access customers etc. as per TATA POWER billing requirement.

5.1.3 Virtual Metering for Customer Service, BI, Energy Audit and Network planning purpose.

5.1.4 On demand / scheduled read request processing.

5.1.5 Device Management (Detection, Provisioning and Commissioning of Device).

5.1.6 VEE (Validation, Estimation and Editing)

5.1.7 Revenue protection module

5.1.8 Event Analyzer / Reporting.

5.1.9 Analytical module to handle logics for handling data from different sources to device business logics.

5.1.10 Outage Event Managers

5.1.11 Device Control (Remote Connect / Disconnect)

5.1.12 Pre-payment Module / Support.

5.1.13 Demand Response Management System Integration

5.1.14 Integration with existing AMR/AMI system (Analogic & Fluentgrid)

5.1.15 Integration with SCADA-DMS

5.1.16 Integration with Network Planning Software

5.1.17 Integration with GIS

5.1.18 Integration with load forecasting tool.

5.1.19 Integration with CRM/Call Centre Application

5.1.20 Integration with TATA POWER Mobile App & Web-application.

5.1.21 Complete source code of MDMS should be handed over to TATA POWER along with training of TATA POWER staff for same.

5.1.22 Virtual Metering – Use case:

a. Handle Input meter data (ABT meters)
b. Calculating co-incident demands with time stamping.
c. Processing of Bulk supply bill (15 min interval input data)
d. Reliability Index calculation

5.1.23 Universal Calculation Engine with Mathematical, Logical and Statical Operators.

5.1.24 Integration for Real time BI system & Standard ETL Process / Tools.

5.1.25 All parameters as per Meter Specifications should be catered to by MDMS.

5.1.26 This RFP will include supply of all above mentioned modules along with technical specification required to run the supplied software for 0.1 million endpoints with a data storage of 7 years with 15 minutes of interval data along with all other type of meter data.

5.1.27 This RFP also include installation, commission, and testing of the MDMS along with integration of MDMS with other application of Tata Power as asked for in this RFP. Bidder to complete installation and integration of MDMS before the supply of meters. Bidder shall provide perpetual license along with 7 years of warranty from date of purchase. Bidder should also provide all the updates free of cost during warranty. Bidder should also provide the required training to the users for operating, developing system and administrative training to selective persons for running system after support period free of cost.

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

5.1.29 The bidder shall provide onsite warranty after user acceptance of all supplied, installed, configured, and commissioned system. Any software updates, upgrades, patches released till the completion of warranty period shall be supplied, installed, and commissioned under scope of agreement / PO / RC. Training to TATA POWER employees on new version of software from the OEM or OEM's certified training partner shall be arranged by the bidder. Bidder shall maintain the software on 24X7 basis during Warranty period as per agreed SLA.

5.1.30 The Software licenses will be in the name of Tata Power and will be perpetual in nature.

5.1.31 System will operate in English language.

5.1.32 System should have a reporting system in GUI form which can plot any report using different parameters of meter for user analysis purpose.

5.2 MDMS Functional Requirements:

5.2.1 The MDMS system shall support multiple billing system and multiple Head-end-System (HES)-AMR / AMI System integration.

5.2.2 MDM should integrate with existing/futuristic systems/processes, implemented by TATA POWER, within contract period of successful bidder business applications. BILLING SYSTEM & CRM, SAP ERP S/4 HANA are applications that are implemented/final stages of implementation. Some futuristic applications that would be rolled out gradually are GIS, ADMS, Network planning & analysis, Field Force Automation, Big Data Analytics System. List of futuristic systems are illustrative, actual deployment may differ as per company strategy.

5.2.3 MDMS shall be designed to work in a 'Main' and 'Standby' mode wherein two instances of the software will be running on different systems with the 'Standby' assuming functionality in the event of failure of the 'Main' system.

5.2.4 Also, the MDMS software should support Active/Active mode through server load balancer.

5.2.5 All integration between MDM system and other systems of Tata Power should be based upon SOA methodology. Successful bidder responsibility wrt integration with other Tata Power systems would be limited to development related to its own system only (includes but not limited to API design, API, development, API consumption, integration testing). However successful bidder shall be responsible for jointly defining integration approach, methodology and design.

5.2.6 TPC can also decide to integrate another make HES's with the bidder supplied MDMS. Bidder shall provide all the required support for integration of the same.

5.2.7 It shall support handling of data polling at different interval on the basis of rate category.

5.2.8 MDM shall also be integrated with consumer mobile application of TATA POWER.

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

5.2.10 The MDMS shall comply to EPRI IEC 61968-9 interoperability.

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

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

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

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

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

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

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

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

5.2.19 The MDMS shall revalidate any data if user edits or manually estimates. Should be able to have provision for holding premise type, type of work, Latitude and Longitude in addition to other master data.

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

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

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

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

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

5.2.25 The MDMS shall have the ability to respond to the billing request with estimated readings within one business day of receiving a billing request from CSS if actual readings cannot be obtained and are not received.

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

5.2.27 We will create Reading Quality Checks which system should follow while uploading reading in TPC Billing system and should generate exception log reports which authorized user can check and process on case to case and bulk basis.

5.2.28 MDMS should have capability to retain data of at least 1 lakh endpoints for last 7 years (All type meter data).

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

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

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

5.2.32 Provision of additional VEE logic insertion along with existing ones and modification in existing logics.

5.2.33 Instantaneous data should flow from HES to MDM also and provision for ODR scheduling of instant data.

5.2.34 The MDMS shall provide a mechanism to receive disconnect and reconnect commands and transmit them down to the appropriate Head End Systems for activation and should receive the feedback and update in TPC Billing System for same.

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

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

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

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

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

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

5.2.41 Provision of importing data of meters without linking with Connection Account on authorization basis. (Use case : Analysis of data of meters which are procured and are under testing.)

5.2.42 The MDMS shall have the ability to define groups of meters that will apply unit modifications, e.g. if a meter is read in Wh/VARh/VAh and TPC Billing requires kWh/kVARh/KVAh, to allow TPC Billing System to process the data, and facilitate the translation.

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

5.2.44 Outage messages passed on by MDMS should minimize the outage traffic to upstream Outage Management System (OMS). The MDMS should study the published affected customers / other units then should transfer the additional outage list to OMS. At the same time if it has a new “first breath” response from the field, later than that of OMS list, should also publish to OSM as restored ones.

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

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

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

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

5.2.49 The MDMS shall have the ability to perform VEE functions as part of the bill determinant generation process on a meter or multiple meters, possibly across multiple service points containing more than one meter, for which there may be multiple reading types (i.e. interval, time of use, scalar, etc.)

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

5.2.51 The MDMS shall send billing determinants for all end point meters regardless of whether a customer is active. (A report of exception should be populated)

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

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

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

5.2.55 The MDMS application shall supported a Database.

5.2.56 The MDMS shall run on an enterprise Red Hat Linux operating system/Windows Server of enterprise version.

5.2.57 The MDMS shall be capable of running under a virtualized environment

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

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

5.2.60 The MDMS shall support end-Users and Administrator security, including:

- Individual, named accounts for each end-user and administrator
- Role-based security
- Administration privileges provided only through specific authorization
- Configurable, fine-grained access by service delivery point
- LDAP v3 compliant integration
- SSL secured communications

5.2.61 The MDMS shall support system integration security, including:

- Web-services REST protocol with API gateway.
- Keystore used to manage certificates and access credentials
- Support for Mutual or 2-Way authentication
- SSL secured communications

5.2.62 The MDMS's underlying data shall support the following security mechanisms:

- Role-based security for database and application administration, application operations and execution, ad-hoc read-only privileges
- AES-256 bit encryption for persisting sensitive data at rest
- Key store to manage certificates and access credentials
- SSL secured communications

5.2.63 The MDMS shall have the facility/ integration API of customer portal offering which provides the following functions:

- Produce interactive charts & heat maps that toggle between interval, hourly, daily and monthly usage
- Compare monthly usage with nearby consumers, i.e. neighbourhoods or with the entire utility population
- View graphical representation of monthly usage totals and bills for past 2

years
- Set energy markers to note efficiency upgrades
- Projected consumption, consumption trends, previous consumption history etc.
- It should support the various alerts like peak hour consumption high for day and month, slab crossover alerts, demand alert, pf alert, non-occupancy alerts, abnormal consumption alerts.
- Tata Power will share a BRD with the list of 100 use cases to be custom configured/ developed. Bidder is requiring developing the API in Tata Power required format for the same.

5.2.64 Ensuring entire back up & restoration of data on predefined frequency will be the responsibility of bidder.

5.2.65 System must support synchronous and asynchronous data transfer between MDMS & other systems.

5.2.66 MDMS shall support integration with various OT systems. Examples -GIS, CRM, consumer portal, SAP ISU and other required systems.

5.2.67 SAP standard connector must be available for smooth SAP interface.

5.2.68 Bulk (Entire population at once) , grouping, individual data transfer facility shall be available between MDMS and other interfaces.

5.2.69 Real time data transfer between MDMS & SAP.

5.3 Mandatory Requirement:

5.3.1 The bidder should have experience of integrating its system with SAP System on SOA based methodology.

5.3.2 MDMS should have capabilities to deliver all the technical and functional requirements including integration with third party system at MDMS end along with legacy system integration.

5.3.3 The Bidder should have experience of integration with utilities legacy system working on MIOS/MODBUS/DLMS.

5.3.4 Bidder should have experience of successfully deployment of Energy Auditing, Virtual metering, Billing Determinant, VEE, Revenue protection module in at least 2 separate utilities.

5.3.5 Bidder should have experience of integration of Customer Web Portal & Mobile App with MDMS as per features mentioned in technical requirement.

5.3.6 Bidder should be capable of integration of existing Revenue protection logics of TATA POWER and should also be capable of catering to future requirement and changes in addition to their standard revenue protection module.

5.4 Performance Requirement

Required reports to check performance should be provided by bidder

5.4.1 MDMS should be able to process the data of 0.1 million meters interval data of 1 day within 15 min interval and move the data to other integrated application.

5.4.2 MDMS should be able to process and generate billing determinants of 0.1 million meters within 1 Hours this will include receiving the data from HES, calculation of billing determinants and posting the data in billing engine and generation of all exception reports related to billing parameters.

5.4.3 MDMS should be able to generate billing determinants of meter with in 1 hour after receiving it from HES system and post it into billing engine.

5.4.4 Customer Data: Customer should be able to get data from system from Portal/App within 1 Sec to 5 Sec on varied Use case.

5.4.5 CRM on Realtime – for single customer use case with in 2 sec.

5.4.6 There should be option to extract all the reports in bulk in various format like Excel, pdf, csv, rtf, html of the end metering points. (up to 1 lakh meters at once, over that option to download report in batches of 1 lakh meter)

Data Transfer between Systems within 1 hours with up to 10 systems

a) TPC Billing System
b) ADMS
c) Legacy MDAS, third party HES and bidder own HES
d) GIS
e) Big data analytics system
f) Network Planning software
g) SAP ERP S4/HANA
h) CRM
i) Customer Portal
j) Field Force Automation

5.5 System Configuration:

5.5.1 The System Supplier is requested to propose a system configuration that will support the technical and operation environments outlined in the previous sections and meet the system size, performance, availability requirements.

5.6 System Environments

5.6.1 The configuration - including LAN / WAN and wireless communication modules as well as application, database, communication servers - shall support the following environments:

- Development environment
- Testing Environment
- Production environment

5.6.2 Optimum sized development hardware i.e. servers, firewalls along with required OS, DB, security solution and other required components to be loaded on the server sufficient to carry out project related development and testing should be provided by the successful bidder as a part of offering. These main & DR servers should have minimum 7 years of warranty.

5.6.3 Within first two months of Project Kick Off, successful bidder shall finalize detailed BoQ, Data Center architecture, specifications and deployment plan of production environment Hardware and related components.

5.6.4 The development is to be carried out on development server and complete source code is to be handed over to Tata Power.

5.7 Cyber Security

Smart grid networks introduce a variety of new and attractive ways to increase communication across the distribution system. However, these network entry points also can increase exposure to potential attackers. If left unsecured, these potential vulnerabilities might allow an attacker to penetrate the network, gain access to control software, and alter load conditions to destabilize the distribution grid. The communication security solution should address these risks with an end-to-end security solution that addresses each area of the network, including:

- The Head-end system
- Backhaul communication over the Wide Area Network (WAN)
- Local Area Network layer communication (LAN)
- Physical protection of the network devices
- Mobile Administration Tool security
- Home Area Network (HAN) security
- Bidder to ensure that there is “Zero” cyber security breach while the data is travelling from meter to the output of HES and subsequently to MDMS and to the output of MDMS.
- Third party cyber security assessment has to be done by bidder through CERT-in certified agency.

Solution provider comprehensive approach should include risk assessment, threat modelling and ongoing penetration testing to identify threats and improve security responses. This approach enables the security solution to evolve as technology advances and as threats to grid security inevitably multiply and diversify.

5.7.1 **Cyber Security:**

- TLS 1.2 or above & LDAP support
- Compliance to enforce CIA (confidentiality, integrity, and availability) best practices at system level
- Role-based access control
- Security configuration

- System should maintain audit trail of all successful and unsuccessful activities and any changes made
- Penetration testing by a Cert approved Agency on roll out at the time of Major changes in the solution and once in a year. The selected vendor should mitigate identified gaps with no extra cost to TATA POWER.
- It will be responsibility of bidder to ensure that there should be "Zero" cyber security risk

5.8 System Sizing and Scalability

System Sizing:

System Sizing to be based on considering approx. 0.1 million endpoints with a data storage of 7 years for 15 Minute of interval data along with all other type of meter data.

System should be scalable to 1 million end points

Scalability:

Users accounts should be easily added as system grows. There should be no upgrade involved and no pre-defined limits upto a maximum of 500 users with different roles.

Interoperability:

- Integration with existing applications and futuristic TATA POWER applications

System Requirements/ Compliance Sheet

This appendix enumerates the communications, performance, and security requirements for AMI systems.

Respondents must clearly indicate the item number to which their response applies, using the item numbers listed in the table below.

Item Number	Item Section	Item	Requirement
1.1	Performance	Meter reading throughput	Provide production statistics from customer site where the proposed solution is deployed, demonstrating the time it takes to "sweep" (collect all necessary interval data from) all meters in the network. Also, indicate the total number of meters deployed.
2.1	Security	Authorization	Describe how your solution determines whether or not a user is allowed to access the system, and how it determines what functions a user is allowed to perform (authorized).

2.2	Security	Authorization	Describe how your solution determines whether or not an application is allowed to execute a command on the device and how it determines what functions the application is allowed to perform (authorized).
2.3	Security	Key management	If your devices use “keys” — secure identifiers for device or user authentication - what type of keys are used, how are they deployed into the system?
2.4	Security	Key management	Are keys per-device/per-user, per-application, or shared by all authenticated/authorized elements of the system?
2.5	Security	Key management	Are keys one-time (static) or can they be changed (ephemeral)? If ephemeral, how are they changed? Additionally, provide performance data on how long it takes to change per-device/per- user, per-application, or system-wide keys.
2.6	Security	Data/channel privacy	Is data in your solution kept private (protected from unauthorized interception) during transmission over the network encrypted If so, describe how this is achieved.
2.7	Security	Data/channel privacy	Is data in your solution kept private at rest on the device as well as the back-office? If so, describe how this is achieved.

2.8	Security	Data integrity	Is data integrity (correctness) maintained during communications transfer and/or storage in your solution? That is, is data protected from corruption due to bit errors during communication, storage or memory corruption while at rest, etc.? If so, describe how this is achieved
2.9	Security	Individual device compromise	Describe any protections in your solution against compromise of new devices before they are deployed in the
2.10	Security	Individual device compromise (mitigation)	Describe any device -level protections in your solution against “hacking” — compromise of individual devices after they are deployed in the system.
2.11	Security	Viral attack mitigation	Describe any network-level protections in your solution against viral attacks - mass transmission of unauthorized commands, injection of malicious code (“viruses”), etc.
2.12	Security	Insider threat mitigation - field tools	Describe any protections present in your solution against malicious use of authorized devices (specifically, field tools), due either to theft of such devices or insider malicious use.
2.13	Security	Insider threat mitigation - back-office software	Describe any protections present in your solution to mitigate malicious operation of back office software, specifically by authorized but malicious insider operators.
2.14	Security	Independent penetration testing	Provide evidence of independent, 3rd party penetration testing performed against your solution.

2.15	Security	Using native security features of database	Describe which native security features of proposed database will be used and how?
2.16	Security	Security Threat / Risk analysis	Describe the mechanism you follow to keep watch on current cyber threats and risks. How you incorporate appropriate mitigation measures in your system and deploy them at client side?
2.17	Security	Audit Trail	Describe how and to what extent audit trails are maintained?
2.18	Security	Disaster Recovery	How disaster recovery scenario will be managed? What manual changes / actions are required, if any?
3.1	Deployment/Operations	Asset management	Does your solution provide a mechanism for capturing and storing location information for installed field devices? If so, describe the mechanism.
3.2	Deployment/Operations	Meter	Once a meter has been properly electrically installed in the field, describe what additional manual steps are required to join the meter to the system.

3.3	Deployment/Operations	Disaster recovery	Describe your standard datacenter hardware configuration and software deployment architecture for supporting 2 million meters using your software system. What are the standard Recovery Point Objective (RPO) and Recovery Time Objective (RTO) based on this configuration? RPO is defined to be the maximum period for which data might be lost from your system in the event of a catastrophic failure such as loss of an entire datacenter; RTO is defined to be the time it takes to recover the service completely from a similar catastrophic failure.
3.4	Deployment/Operations	Software integration	Describe the standard interfaces you support for integrating with other back office software systems such as BILLING SYSTEM, HES, Asset Management and Outage Management. If your solution does not support standards, are you willing to provide published documentation of the protocols used?

5.9 Solution for Meter Data Management

General: Following functionalities are required in MDMS.

5.9.1 Input, process, store, and analyze consumption, demand, event, and interval data from multiple AMI data collection systems.

5.9.2 MDM will broker/route read requests to the correct meter reading system for each meter.

5.9.3 Support bidirectional metering.

5.9.4 Support net metering (metering net consumption and energy demand for customers have distributed generation such as photovoltaic on their premises).

5.9.5 Input, process, store, and analyze non-billing meter data such as pulse, voltage, and power quality data as they are available from AMI.

5.9.6 Support schedule and on-demand meter reads and pinging of meter energized states by authorized users and by other utility systems.

5.9.7 Provide the capability for the utility to schedule reports and to do ad-hoc query and reporting.

5.9.8 Provide web-based user interfaces.

5.9.9 Pre-Payment Support. The MDM should support the pre-payment capabilities.

5.9.10 Should be interoperable with multiple head-end system of different make

5.9.11 Capable of integrating with other application through Enterprise Service Bus.

5.9.12 Provide analytical and reporting system and allow access and extract data in common file (e.g. Excel and Access) format.

5.9.13 Should have revenue protection module with Tata Power defined logics.

5.9.14 Device management support.

5.9.15 Virtual metering which can support more than Energy Audit and Network Planning tool.

5.10 Data Repository

5.10.1 Provide online data versioning (i.e. keep versions of the data for audit trail purpose) and storage of register-reads, consumption, interval data, event data, and other meter data.

- Register Reads. The system shall support storage of direct register reads by billing cycle, daily, hourly, or any appropriate acquisition frequency.
- Consumption. The system shall support storage of consumption by billing cycle, daily, hourly, or any appropriate acquisition frequency.
- Interval Data. The system shall support storage of interval data (with Profile Capture Period of 5 Min to 60 min) by channel and acquisition frequency (5 min to 24 hours) for all applicable data types.
- Event Data. The system shall support storage of all collected event and alarm data from meters, network equipment, and MDMS itself.

- Other Meter Data. In addition to kWh or kVAh data, the system should have the capacity to store other potential meter data, for example, kW, kVA, blink counts, voltage, sag & swell, and power quality measures such as harmonics.
- Billing Determinants. The system shall store derived billing determinants and versions of data (interval data, consumption data, etc.) used to calculate them. Billing determinants consist of data for the TPC billing application to determine the bill amount without having to do any complex calculations (or any calculation at all. This requirement assumes MDMS will be used for complex billing rates such as Peak-Time Rebate in the future.)
- Virtual metering: The system should be able to calculate virtual channels / register for billing and Energy Audit purpose and Network Planning purpose.
- Net Metering: The system should be able to generate billing determinant directly from Net Meters using register read or 15 minute interval data, as well as from set of multiple meters using virtual metering component for normal Billing, TOD and Open access consumer.
- Data Integrity: MDMS Vendor has to ensure the data integrity i.e. data is coming from Head end system is not edited / deleted / modified and is maintained with proper versions no.
- Instantaneous Data: This system should record instantaneous Voltage, Current of all three phases, Active, reactive and Apparent Power and should be able to plot the same in Vector form.

5.10.2 The system shall have built-in processes to archive data to external data storage.

5.10.3 Facilitate online access to all data by authorized users and other utility information systems and applications.

5.10.4 System should have graphical representation of data for editing.

5.11 Meter Data Processing and Analysis Revenue Management

5.11.1 Analyse meter tampering flags, power outages, and usage trends to find potential revenue protection issues and generate alerts and notifications automatically.

5.11.2 Analyse consumption to detect potential irregular usage of electricity and generate notifications.

5.11.3 Monitor "consumption on vacant/not in use premises" (registered reads above utility configurable thresholds without an active customer account) and automatically generate alerts and notifications.

5.11.4 Analyse potential tamper events as per Legacy logics of TATA POWER which will be shared during project implementation phase. This will require Universal calculation Engine with Logical, Mathematical and Statistical operators

5.11.5 System should be able to run different custom defined logics for capturing revenue leakage.

5.11.6 **Summation and Aggregation**

- Capture and aggregate metering data from a specified number of arbitrary physical meters. Allow system and user access to the aggregated data as if the aggregation is from a meter (virtual meter).
- This capability will support consolidated billing, load research, transformer load management, etc.
- Synchronize demand and energy reads to determine total demand and summation energy for a user-selected set of meters (the virtual meter) by scheduling demand and bill reads of the meters via the AMI head-end at a user-specified time.
- Net metering - aggregate data for a specified number of service points or channels with the ability to totalize data across multiple channels of the same meter ID. (Net kWh consumption is calculated by deducting the kWh from premise to utility from the kWh from utility to premise for each meter read interval. Objective is to bill customer for the net consumption (and/or demand) in case the customer has a Distributed Energy Resource such as Photovoltaic.). These can be direct register read from Net Meters.
- Bidirectional metering - provide the ability to totalize positive and negative meter read values across multiple channels of the same meter ID separately.
- System should have the provision of mapping the Virtual meter with physical assets.

5.11.7 **Validation, Estimation, and Editing (VEE)**

1. Perform programmatic data integrity checks including for example, checksum, time check, pulse, and overflow, on all metered data received from data collection systems.
   - The system shall identify, flag and timestamp any missing or corrupt data and generate reports. Validation rules shall be configurable by data type (e.g. interval data, load survey, midnight data, billing data), meter and AMI technology, and

customer class.

- The system shall provide a Graphical User Interface (GUI) for configurable validation parameters and support the ability to configure validation rules for specific data type, meter and AMI technology, and customer class.
- The system should also notify the list of meters that have missing or corrupt data and should provide tab for command to pull data for those meters.
- System should also populate the report of the meters whose data is not received even after set no of retries.
- System should also report list of the cases which have been estimated earlier but now actual data has been reported by system.
- System should have provision of plotting all non-communicating meters on Google/GIS map to identify problematic geographical area if any.

2. Perform data verifications for zero consumption, daily high/low consumption limits, billing cycle, etc.
    - Zero Consumption. The system shall identify any meter with no change in registration for a programmable number of days and generate alerts/notifications as appropriate.
    - Daily Consumption Verification. The system shall identify any meter daily usage above or below a programmable threshold and generate alerts/notifications accordingly.
    - Billing Cycle Verification. The system shall identify any meter with cumulative usage since the last bill greater than a programmable threshold and generate alerts/notifications. The utility will be able to set different programmable thresholds for different customer types and tariffs.
    - Complex Daily and Billing Cycle Verification. The system shall perform the same checks for all daily and billing quantities including demand and coincident demand for active, reactive, and apparent quantities across monthly billing, Time-of-Day/Use, and interval data.
    - Comparison of consumption calculated by load profile and that calculated from registered reads. The system shall generate an error notification when the deviation exceeds a utility specified threshold (e.g. 100 kWh or 0.01% of total consumption and these threshold should be user configurable).
    - System should be flexible to generate user defined reports for reading quality check.
3. Automate estimation and allocation routines based on programmatic rules and historical data.
    - The system shall flag all estimated or allocated data, identify data gaps (where automatic estimation and allocations cannot be accurately performed), and generate alerts/notifications for manual data editing. The estimation shall cover all data types, from the meter, whenever applicable.
    - The system shall provide a GUI for configurable estimation parameters and support the ability to configure estimation for specific meters/accounts or groups of meters/accounts. Additionally, the system shall support the ability to establish specific thresholds or boundaries for estimation on specific accounts

by meter/customer, group, tariff/rate, or energy provider. Exceeding such a threshold post estimate would flag the need to manually edit the data.

4. Allow manual editing of missing or estimated/allocated data.
   - A GUI must be provided for the user to view and manually edit missing data and allocated/estimated data.
   - The system must clearly distinguish visually between metered and estimated/allocated data with stamping of authorized user.

5. The system should include a graphical user interface to highlight the success read rate and the system should have both manual and automatic "Retry-After-Failure" capability in case the success rate is lower than the required performance requirements.
6. System should have intelligence to identify between missing intervals and power failure while applying VEE.

5.11.8 **Audit Trail**

- Store and provide versioning of all raw data entry and data edits, including direct meter register reads, estimated, allocated, edited, and otherwise derived data.
- The system shall track all meter data through its lifecycle from direct meter reads to billing determinants, including automated estimations and adjustments by the system and user edits in MDMS.
- All data entries and changes shall be logged, and time stamped. ID of the user who edited the data shall be part of the log.
- Track the data collected versus the data exported to billing and the time relationships of each. All the data downloaded should be exported to TPC Billing System for billing. Report of the meters which have not been exported should be provided on monthly basis and user defined interval.

5.11.9 **Billing:**

- System should be able to calculate the billing determinants out of the cases correctly downloaded. There should be reporting on real time basis for all the meters for reading schedule.
- Schedules of billing determinant should be mapped with reading schedule of TPC Billing and with HES.

5.11.10 **Scheduling**

- Schedule meter reads as needed for in-cycle billing reads, off cycle meter reads for move in & move out, and special reads for re-bills, etc. Request for same will be send vide notifications from TPC Billing to MDMS on real time basis.
- System should be capable of configuring billing cycle of same meter as changing schedule meter read and billing date.
- Calculate billing determinants on schedule or on request by authorized users or by

other utility information systems.

- The system shall be able to automatically calculate and deliver billing determinants based on billing cycle. The system will have a configurable calendar that matches calendar dates with billing cycles.
- The system shall allow multiple billing cycles to read on the same date.
    - The system shall be able to calculate and deliver billing determinants based on ad hoc requests from CRM or an authorized user. The request will have at a minimum the end date for the billing period. The system shall be able to infer the start date based on the date when billing determinants were last calculated.

5.11.11 **Billing Determinants**

- Support the processing of consumption reads and interval data into billing determinants to support total consumption, demand, and time-of-use (TOU), and maximum-demand rates.
- Allow the utility to configure multiple TOU options (e.g. the number and duration of TOU rate periods) by customer type, tariffs, and by season.
- Allow the specification of holidays and recognize that these days fall into the off-peak category and for defining different Time of User settings.
- Support conjunctive billing where interval data is totalized across multiple sub-meters into one master meter (virtual metering) prior to aggregating the consumption and demands into the appropriate TOU periods. The system shall be able to identify meters that are part of a conjunctive relationship. (Sub-meters and master meter can be located in different locations far from each other)
- Support consumption adjustments where interval data is adjusted by a certain fixed percentage due to a variance in the service voltage level. The system shall be able to identify meters that require an adjustment.
- Support transformer loss factor adjustments where interval data is adjusted by fixed percent due to various loss factors. The system shall be able to identify meters that require an adjustment.
- Allow users to view, print, and modify the aggregated data prior to sending to CRM for billing.
- Support calculation billing determinant from a set of meters where consumption of all meters is totalled and MDI of one meter with highest is used.
- Supports calculation of meter determinant with special logics / legacy logics.
- The system should be able to take data from different HES / Meter Data Acquisition Systems for determining billing determinants.

5.11.12 **Meter Asset Management**

- Monitor and identify meter diagnostic flags such as stop-meters for automated event notifications.
- Generate service order requests for scheduled meter tests and battery replacements, etc. Support exchange-on-test processes.
- Track and maintain meter to communication module and communication module to network connectivity, meter and communication module configuration, firmware revisions, etc.
- Track and maintain data route of meters and report if these is a mismatch in expected route.

5.11.13 **AMI System Management**

- Automatically generate service order requests based on diagnostic events from the AMI system and equipment.
- Capture and track resolution of data exceptions, product problems and failures, etc.
- Collect AMI system performance data, trend performance over time, and generate reports.
- The MDMS shall be able to synchronize the system time with the AMI head-end to a single system time source to be specified by the utility, to within thirty (30) seconds to top of the hour (e.g. synchronized at 07:00, 08:00, 09:00, etc.)
- System should be able to generate the report of the meters which have a deviation in time of more than 1 hour and if the meter is billed in TOU or open access basis should not be corrected on its own.

5.11.14 **Customer Service Support**

- Provide online web access through the utility Customer portal to current and historical consumption and interval data. The MDMS customer portal services to be integrated within the TPC Billing to have a unified customer self-service avenue.
- Automatically generate high/low consumption alerts.
- Execute disconnect/reconnect service orders from an authorized user via multiple remote disconnect and re-connect AMI systems.
- Execute disconnect/reconnect service orders from an authorized user via “virtual disconnect” – automatically set the daily consumption monitoring threshold to the utility configurable level and generate “consumption on vacant” alerts or notifications when the threshold is exceeded.
- The consumption threshold may be set by consumption (kWh / kVAh / kW / kVA / pf) or percentage of historical daily average. Different thresholds may be set for different customer and rate classes.
- Automatically notify customers of significant events or customer pre-set thresholds such as a demand threshold, power factor threshold, critical peak period or month-to-date bill thresholds via e-mail, telephone, or text message using the utility's existing multimedia communication infrastructure.
- Should have provision of estimation of bill of the consumer on request of consumer through proper authorization.

5.11.15 **Real-time Applications Support**

- Support requests for on-demand reading and pinging of meters from users directly or from other utility systems and applications.
- Process meter outage notifications (last gasps) and restoration events (first Breath), filter the events against known service orders based on the utility business rules, and relay the messages to Appropriate System/OMS. Should have ability to distinguish fictitious signals and momentary power failures and isolate them. OMS system should not be flooded by these notifications and intelligence should be built in. Storm mode, work order open, scheduled outage should be filtered out. If a feeder is out, then notification should be generated intimating that feeder is out rather than for all the meters down.

- Process events such as demand threshold, high/low voltage, etc.
- The system shall capture date and time stamp receipt of all device and system events when received by the system (in addition to the date and time stamps coming from the AMI meters or communications equipment).
- The system shall log all events for post incident tracking.
- System should filter out all the reading in which date time stamp of meter data received from the meter and that of system is more than 1 hour should be flagged.

- BI system may want to use real-time data analytics i.e. without transferring the data to other system, but to run the query in the MDMS system along with and/or logical joining of other data sets.
- Workflow required Data from Legacy TATA POWER Applications Billing or Enterprise Content management System kind of applications.

5.11.16 **Planning and Engineering Support**

- Support load profile analysis and display for any user specified virtual meter or set of virtual meters.
- Support “system load snapshot” by collecting meter reads at a user specified date and time.
- Allow the authorized user to cancel a “system load snapshot” after it has been configured in the MDMS.
- Enable export of meter data (Billing, load profile), “system load snapshot”, voltage, power quality, etc. to a common file format (e.g., Excel, Access, etc.).
- Virtual Metering. The system shall capture and aggregate metering data from a specified number of arbitrary physical meters. Virtual meters shall support all metering functionality allowed by the lowest common device capability.
- The system shall have a user interface to enable a user to create virtual meters and assign physical meters to a virtual meter or remove physical meters from a virtual meter.
- The system shall allow the user to add or remove one or more physical meters from a virtual meter.
- The system shall allow assigning one physical meter to more than one virtual meter.
  - The system shall be capable of receiving virtual meter relationships from an external system such as GIS / BI / Homegrown Application or a distribution engineering analysis application.
- Load Profile
  - Display load profiles by season and day type (weekday, weekend, holiday, etc.) and by rate class, customer type, or any user specified collection of meters.
  - Allow the user to export the raw load profile data to a common file format such as Excel and Access.
  - Allow access and export to common file format (e.g., Excel and Access) other AMI meter data such as voltage sags and swell, and power quality.

5.12 System Integration Requirements Solution Architecture

This section describes the system interface requirements assuming full AMI deployment. General Requirements

- The system shall include Application Programming Interfaces (API) and/or adaptors to support system integration with other information systems as outlined in this section.
- The system shall comply with the latest version of the IEC 61968 Common Information Model (CIM) and shall continue to comply with future versions through annual software maintenance program.
- Support interfacing with multiple metering systems in general. Integrate with the data collection systems to provide the functionality specified above.
- Allow other systems and applications to access "real-time" data (such as on-demand reads and meter pings, outage, and distribution automation events), and historical information (such as meter reads and AMI system service histories.)
- System should be operating on Oracle data base 12 C or any other DB with better specifications.

5.12.1 **AMI Data Collection/Head-end System(s) - MDMS Integration**

- AMI System Deployment Status. AMI head-ends shall send to MDMS installed AMI meters status.
- Meter/Module Configuration Synchronization. AMI Data Collection/Head-end shall synchronize with MDMS meter/module configuration including time at least once per day.
- Real-time Read/Status Request & Response. MDMS shall send to AMI Data Collection/Head- end at the request of a CSR or other user to do on-demand read/status in "real-time" when schedule read/status is not adequate. AMI Data Collection/Head-end will send back to MDMS real-time read/status.
- Real-time Event Notifications. AMI Data Collection/Head-end shall notify MDMS of the event such as outage in real-time when meter losses power more than a configurable time duration.
- Scheduled Meter Read Data. AMI Data Collection/Head-end shall send to MDMS the meter read data as scheduled at predefined frequency.
- AMI System and Meter Events. AMI Data Collection/Head-end shall send to MDMS AMI system and meter events such as meter diagnostics.
- Demand Response events, start & end date/time. MDMS system shall send to AMI Data Collection/Head-end demand response events including start and end date/time to reduce demand when the system demand is likely to be highest. In consequence, AMI meter will relay to DR in-home devices and in-home display. AMI Data Collection/Head-end will send to MDMS demand response status.

5.12.2 **MDMS Integration with TPC Billing System**

- AMI System Deployment Status. MDMS will notify TPC Billing System(SAP) of installed AMI meters, the MDMS has heard from the AMI head-ends.
- Billing Read Schedule. Billing System shall send to MDMS a bill read schedule such as

the last daily read for a specified meter.

- Scheduled Billing Reads. MDMS shall send to Billing System at the request of a Customer Service Representative or other user the most current read of a meter as scheduled, which is usually the last daily read (this should suffice for most billing inquiries). The user can choose to do on-demand read in “real-time” only if the last daily read is not adequate.
- On-demand Read. If the scheduled billing read is not adequate. Billing System or the user can choose to do on-demand read in “real-time”. Billing System shall send to MDMS an on-demand read request for a specified meter.
- On-demand Read Results. MDMS shall send to Billing System at the request of a CSR or other user the on-demand read results if the scheduled billing read is not adequate.
- Edited Meter Read Transactions. Billing System shall send to MDMS on an event basis consumption and demand data used for billing, which has been edited within BILLING SYSTEM, usually during a rebate or rebill scenario.
- Billing Determinants. MDMS shall send to Billing System the billing determinants for on-cycle scheduled reads or off-cycle requested reads.
- Billing Determinants Request. Billing System shall send to MDMS a request the MDMS to send billing determinants for off-cycle reads. This interface can also be used by the utility to request on- cycle reads. The request will include the meters to be read and the billing date. A request can have a billing date in the future or the past.
- Consumption Alerts. MDMS should send to Billing System consumption alerts for virtual disconnects or prepay accounts based on the utility's configurable thresholds. This interface will be on an event driven basis.
- Disconnect/Reconnect Request/Response (Virtual, Remote, And Physical). Billing System shall send to MDMS requests disconnect and reconnect specific accounts. Billing System will notify MDMS if these actions are to be virtual disconnect, remote disconnect/reconnect, or physical onsite disconnect/reconnect.
- Revenue Integrity Alerts/Notifications. MDMS shall send to Billing System alerts/notifications for tampering, consumption on inactive meters, etc.
- Tariff Changes. Billing System shall send to MDMS tariff change (e.g. TOD, TOU) when there is change in Tariff structure or programs.
- Customer Information Update. Billing System shall send to MDMS customer information update.
- New Installed Meters. Billing System shall send to MDMS information on new meter installations.
- Integration with Current TPC Billing Landscape and its existing business processes
- Integration with existing TPC Billing system shall be the responsibility of the bidder. The bidder shall propose the middleware, if required for integrating with TPC Billing system. Any transformation required for seamless integration will be the responsibility of the bidder.
- All custom interfaces development in TPC Billing and integration with MDMS should be carried out by the successful bidder

5.12.3 **TPC Billing/ Third Party Prepay Application**

- Disconnect/Reconnect Request: SAP/ Third Party Prepay Application shall notify MDMS when the consumption of a customer enrolled in pre-pay reaches one or more configured threshold levels.
- Prepay Accounts: SAP/ Third Party Prepay Application shall send MDMS prepay account information of a customer enrolled in pre-pay.
- Interval Meter Reads: MDMS shall send SAP/ Third Party Prepay Application interval meter read of a customer enrolled in pre-pay.
- System should have provision of reading the meter at a higher frequency if meter is tagged as pre-pay meter.
- Prepay Application must be well integrated with TPC Billing Module.

- AMI Meter Service Requests. MDMS shall send to TPC Billing, AMI meter service requests for activities for ad hoc or scheduled service activities such as a dead meter or battery replacements. TPC Billing shall return completion information to the MDMS upon completion.
- AMI Meter Service Completion. TPC Billing shall return completion information to the MDMS upon completion of AMI Meter service.
- Customer/Meter Configuration Synchronization. TPC Billing shall send to MDMS customer/meter information (e.g., customer account, meter information, commodity, meter route, demand response enrolment, etc.) as needed.

5.12.4 **Customers with AMR**

- Daily Bill Read Request: MDMS shall send to C&I Customer AMR manually collected read request for daily read for a specified meter.
- Daily Billing Reads. C&I Customer AMR shall send to MDMS manually collected reads in order to create a centralized data warehouse for all reads collected.

Future Requirement- Provision to be kept for integration

5.12.5 **Demand Response/Load Management System (DR/LMS)**

- Demand Response events, start & end date/time. DR/LMS/ADMS system shall send to MDMS demand response events including start and end date/time to reduce demand when the system demand is likely to be highest.
- Load Profiles. MDMS shall send to DR/LMS/ADMS system load profiles for analysing DR events.
- MDMS should be able to create baseline profile for customers through custom defined algorithms based on past data available in the MDMS system.

5.12.6 **Work Management System (SAP PM)**

- Service Order Requests: MDMS shall send PM Service order requests as appropriate based on AMI communications infrastructure events.
- Service Order Completion Information: PM shall send MDMS service order status (open and completed) and completion information, which MDMS will use in service and performance historical analysis.

5.12.7 **Outage Management System (OMS)**

- Outage Verification Request: OMS shall send to MDMS a request to verify a service outage when a trouble call is not part of a known outage. MDMS will perform an on-demand ping to verify the meters are receiving energy.
- Outage Notification: MDMS shall collate the outage notification based on hierarchy as imported from GIS.
- Restoration Verification Request: OMS shall collate the outage notification based on hierarchy as imported from GIS. This will be done prior to calling back customers via the IVR.

5.12.8 **Multimedia Communication**

- Usage Profile, High-Bill Alerts, DR/Load Management Events, etc.

- MDMS shall send to Multimedia Communication current and history usage profile, high-bill alerts, DR/Load management events, etc. to provide to customer through online web access, IVRS, Mobile App, etc.,

5.12.9 **Geographical Information System (GIS)**

- Meter-Transformer Connectivity: The interface shall extract bulk data load and incremental updates of meter-transformer connectivity data from GIS and load the data in the MDMS distribution network model. The interface should synchronize the data in GIS and MDMS on a daily schedule or as changes are posted to the GIS master database (event driven).
- AMI System Asset Data: The interface will synchronize the AMI system asset data between AMI head-end/MDM and GIS, including new assets, required assets, and changes to asset connectivity and status.
- MV & LV Connectivity: The interface shall extract bulk data load and incremental updates of MV & LV connectivity data from GIS and load the data in the MDMS distribution network model. The interface should synchronize the data in GIS and MDMS on a daily schedule or as changes are posted to the GIS master database (event driven). The Connectivity Details & Event Details would be shared during Blue Printing Stage.

5.12.10 **Network Planning Tool& BI Requirement**

- Load Profiles. MDMS shall send load profile data to the Network Planning Tool.
- Aggregated Load. Based on the meter-connectivity, MDMS shall send to the Network Planning Tool application monthly the peak load of transformers based on aggregated loads of meters served by the transformer.
- Loss Calculation. Calculate the total, technical and non-technical losses of the LV network supplied by a Power Transformer by subtracting the aggregated consumption reads of meters on the LV network from the meter read at the PT.

5.12.11 **Distribution Planning**

- Load Profiles. MDMS shall send load profile data to Distribution Planning
- System Load Snapshots/Save Cases. MDMS shall send system load snapshot (i.e. synchronized demand reads) to Distribution Planning.

5.12.12 **Distribution Management System (DMS)**

- Load Profiles. MDMS shall send load profile data to DMS.
- Meter Load. MDMS shall send system load snapshot (synchronized demand reads) to DMS.
- Voltage. MDMS shall send voltage data from select meters to DMS.

5.12.13 **DER:**

The system requirements specified above can also support enabling applications such as DER Distributed Energy Resources (DER).The following AMI functions that have been specified above will be useful in integrating DER such as photovoltaic generation (PV) into the utility distribution network:

- Interval reads and load profile to detect the presence of customer-owned small PV units
- Meter read summation and aggregation if the PV is separately metered (by a sub-meter or via a separate channel of the same AMI meter)
- Net metering and detection of reverse power flows to protect safety from reverse flows from the PV back to the distribution network. (Standard DER protection guideline is to trip the DER off the distribution grid when a power outage is detected. This requirement is intended to give system operations a backup safety provision in case the customer DER installation does not follow the standard protection guideline.)
- Another meter defined as solar meter which is connected at the Solar Generation Unit end to measure Solar Generation Only, to be accounted separately against the same Contract account with which the Net meter is attached. From this metering unit renewable power obligation to be calculated for the utility.
- The same unit calculation of Solar Meter can also be required to derive net unit of any other installation solar meter of same customer or can be distributed on contracted % of ownership of any plant on multiple Contract Accounts.
- The Net Meter Unit to be calculated as billing determinant logics as per the prevalent Regulatory Tariff Guidelines. These stages may be advanced or delayed during implementation station if required from business prospects.

5.13 Reports and MIS

Reports/ MIS shall be required to be developed for utilization of data captured from system. Few samples critical reports are as below: [1]

- Report of Meters whose data not received from HES as per schedule
- Reading Quality Check exception reports
- Exception report on cases held up in MDM which are not posted in Billing Engine
- Interface Summary reports for all the system integrated with MDM
- Standard Analytical report as per solution
- Solution should be able to Generate Vector Diagram on the basis of Instantaneous

data as well as events data

- Area Wise Aggregation reports
- Network-wise Aggregation reports
- Asset Management reports
- Meter wise Comparison reports
- Day wise Comparison reports
- Load profile consumption reports
- Daily consumption reports
- Monthly Consumption reports
- Alarm Dashboard reports
- Consumer Analysis reports
- Network wise consumption reports
- Area Wise consumption reports
- Area wise Event Analysis reports
- Network wise Event Analysis reports
- Loss Analysis reports
- Network Details reports
- Signal Strength reports
- Panoramic View reports
- Service orders reports
- Performance Factors reports
- Peak Vs Off Peak reports
- VEE->Validation Status reports
- Data availability reports

Various reports other than the dashboards mentioned above are to be also provided:

- By Event
- by Meter
- Power failure details
- Net Metering Billing
- Load profile
- Billing Parameter
- Monthly Net Metering
- Daily Net Metering
- Load survey report
- Load factor report
- Power factor report
- Utilization factor report
- Current Imbalance report
- Audit log Report
- Notifications
- SMS Transaction Report
- Consumption violation
- Load violation

- Load violation Network wise
- Consumer violation
- Load pattern
- Monthly billing report
- Daily billing report
- Area Wise Aggregation
- Daily billing Estimation report
- Billing Exception report
- Unidentified meter report
- Below Avg Consumption
- Billing No Read
- Missing intervals
- Energy Loss Report
- Meter communicated Status Report
- Suspected Meters Report
- Physical Meter Event Report
- Meter change Report
- TOU Validation Report
- Feeder Loss Report
- Defective Meter Report
- High Usage Report
- Daily Billing Data Report
- Data availability Report
- Max Demand Consumer Report
- Monthly billing reading
- Connect and disconnect report
- Abnormal Consumption Report
- High Consumption consumers report
- Monthly billing count
- EOB Report
- Stop meter Report
- Service order Report
- Manual Entry Status Report
- Monthly consumption Network wise
- Monthly consumption Area wise
- Spike check report
- Export Data violation
- Removed Meters Report
- RTC Failure Cases
- Data Retention Report
- Firmware Upgrade and Rollback
- Sim Information Detailed
- Sim Information Summary
- Predefined Scheduled Action

- OnDemand Request Transaction
- FOTA Report
- OnDemand Action Low Priority
- Remote Load Control
- OnDemand Action High Priority
- Meter Keys Availability Report
- Offline Action Detailed Report
- Remote Connect Disconnect Report
- Detailed Transaction Report
- Recurring Data Delivery
- Detailed Alert and Notification
- Alert And Notification Report
- Detailed Remote Connect Disconnect
- Offline Action Abstract Report
- Calculation of DT Losses
- Calculation of HT Losses
- Bus Bas and Transformation Losses
- Proposed Consumer Indexing
- Consumer Indexing Verification
- Prepaid Vs Post-paid
- Load Profile Comparison
- Meter connect/ disconnect report shall be given. Where along with connect/ disconnect data readings at the time of connect/disconnect shall also be captured.
-

Detailed reporting requirements will be finalized and signed off during Blueprint documentation stage. Vendor is required to develop around 100 custom built report as per TPC requirement.

System should be able to generate report in schedule form on daily basis on incremental data basis or total data basis.

There should be option to extract all the reports in bulk in various format like Excel, pdf, csv, rtf, html of the end metering points. (up to 1 lakh meters at once, over that option to download report in batches of 1 lakh meter)

6 System Software Requirements

This section describes the standards and characteristics of system software such as operating system, database, and support software (compilers, DBMS, display development, network utilities, report generation, diagnostics, and backup utilities) provided by bidder and the original software manufacturer as necessary to support the functioning of AMI Applications systems. All the system software to be used for the present scope of work shall have valid license(s).

6.1 Software Standards

All software provided by the bidder, including the operating system, database, and support software, shall comply with the industry-accepted software standards. In areas where these organizations have not yet set standards, the software shall comply with those widely accepted de- facto open standards put forth by industry consortiums, such as Open Software Foundation (OSF) and X/Open. The Bidder shall commit to meet the "open systems" objective promoted by industry standards groups.

6.1.1 **Design and Coding Standards for AMI Applications and Utilities**

These provisions are applicable for both software applications and operating systems and would address program features that must be contained in software for the product to meet the standards.

- When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be distinguished textually.

- A well-defined on-screen indication of the present focus shall be if moves among interactive interface elements as the input focus changes.

- Applications shall not override user selected contrast and colour selections and other individual display attributes.

- When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.

6.1.2 **Applications**

All components of AMI application system shall be maintainable by owner using the supplied software utilities and documentation. The software design and coding standards of the system shall address the followings:

- Expansion: Software shall be dimensioned to accommodate the size of AMI application system.

- Modularity: Software shall be modular i.e. functionally partitioned into discrete, scalable, reusable modules consisting of isolated self-contained functional elements and designed for ease of change. The system shall make maximum use of common industry standards for interfaces.

- User-Directed Termination: Functions taking long execution times shall recognize and process user requests to abort the processing.

- Portability & Interoperability: The system shall be designed for hardware independence and operation in a network environment that facilitates interoperability and integration of third-party applications. AMI applications should support multiple Relational Database Management Systems (RDBMS) including Oracle, Microsoft SQL Server and MySQL.

- Programming Languages: The software shall be written using high level ISO or ANSI standard programming languages.

- All applications shall be designed with sufficient background logs which capture various level of errors encountered (warning, fatal, informational) while executing, so that the same can be reviewed and attended to.

6.1.3 **Operating System**

- The operating system of all the equipment of AMI application system including network equipment shall be latest version released up to six months prior to FAT. The operating system shall be hardened to provide robust security. The operating system and data file shall be placed in different disk partitions.

- In order to facilitate cyber security requirements including patch management, common operating system is preferable to be used by all server nodes within the AMI application including MDM/HES servers. This is also to minimize the maintenance. All licenses for Operating System and other application software shall be supplied by the Bidder and shall be valid throughout the contract period.

6.1.4 Time and Calendar Feature

The AMI application & other servers shall maintain time and calendar for use by various software applications. The internal clocks of all servers and workstation consoles shall be automatically synchronized on Network Time Protocol (NTP) protocol. The calendar shall be customizable for working hours, holidays, weekends etc. The holidays, including type of days, shall be entered for each year at the beginning of the year and shall be recognized by all applications.

6.1.5 Remote Diagnostic

Remote Diagnostic facility with necessary hardware as required shall be provided for communication between the AMI application system at the data centre and the NOMC for the diagnosis of hardware & software problems. The login shall be protected by a username & password entry. An automatic logging and intimation shall be provided to inform authorized person from Bidder/Utility/ on such events of remote access and diagnosis.

6.1.6 Development System as a Test Bench

A Development system independent of the production environment shall be defined at the data centre which shall provide testing facility for integration of changes/modifications of the AMI application and new field devices before putting it online with Real-time system. This Development system shall be on a VLAN separated from the production VLAN and shall be self-sufficient to carryout testing of changes/ modifications.

6.1.7 Network Communication

The network communications software shall use a standard network protocol such as TCP/IP, UDP etc. and shall support IPv6. The software shall link dissimilar hardware nodes such as local and remote workstations and peripheral devices into a common data communication network allowing communications among these devices. The network communication software shall include network security, security management, patch management and network services of the AMI system. Network communication software shall have scalability feature as envisaged.

7 Facility Management Services (FMS)

7.1 General Conditions:

7.1.1 Bidder shall provide Facility Management Services (FMS) for the Smart Meter Project for total **7** Year**.**

7.1.2 Under FMS, the Bidder shall provide maintenance support for the designated Hardware, Software (HES and MDMS) and Field devices, provide and maintain the HES and MDMS.

7.1.3 Bidder to submit it's after sale service support plan and escalation matrix in order to meet contractual obligations and performance guidelines. Bidder should have service office in TATA POWER Area, once PO is awarded. The bidder should have sufficient technical person on roll of the company having relevant experience.

7.1.4 Bidder shall carry-out necessary configuration changes/firmware changes in Mass or Individual meter basis as per the TATA POWER request in defined time period, such as converting the meter from Normal Meter to Pre-paid meter, Net-Meter, Bidder shall ensure smooth conversion of the meter in system with correct data flow.

7.2 Scope of AMC & FMS of HES and MDMS

7.2.1 Bidder shall carry out the AMC & FMS of supplied HES and MDMS for the entire contract period. It includes end to end management of system for successful data transfer from meter to SAP, ensure the smooth running of system, keeping the version up to date, compliance of cyber security guidelines issued time to time and ensure the desired availability of system.

7.2.2 They shall carry out development, upgradation and learning from other Discoms. The value is inclusive of platform charges. Requirements for all Discoms including Data Model for Meters, Configuration, Reports, Integration with MDM.

7.2.3 Managing Technology obsolescence and compatibility issues with newer versions of system software.

7.2.4 Supporting in onboarding new OEM, reports and dashboards.

7.2.5 Provision of base product updates, fixes, security alerts and critical patch updates

7.2.6 Base product upgrades which may include general maintenance releases and documentation updates

7.2.7 Assistance with service requests.

7.2.8 Monitoring integration/services integrity and data exchange between various systems.

7.2.9 Debug and fix the operational problems, perform error handling.

7.2.10 Modify existing reports and queries to take care of minor changes, as peruser's requirement.

7.2.11 Providing hands-on assistance to the users to resolve any operational doubts as and when needed.

7.2.12 Monitoring Meter Communication Stats and Data availability.

7.2.13 Performing Data base administration activities.

7.2.14 Configuration management based on the user requirement.

7.2.15 Maintaining the SLA's.

7.2.16 Performing Timely system and performance audits.

7.2.17 Application user role creation and deactivation based on the client requests.

7.2.18 Stabilization the functionality for smooth operations.

7.2.19 Vendor shall depute resident engineer at TPC office for supporting AMC & FMS services.

7.3 Statutory Requirements

- Contractor will make ESIC payment for each employee and will submit receipts of the same to our office on monthly basis.
- Contractor will pay PF contribution for each employee and will submit receipts of the same to our office on monthly basis.
- Contractor will submit registration documents under labor Act, Shops and Establishment act and profession tax.
- Registration under Service tax and welfare board registration will be submitted by you to our office.
- You shall submit PAN number to our office.
- Your Bills will be processed only after submission of statutory documents as above and no payment will be entertained without submission of these documents.
- Attendance sheet should be properly maintained by contractor and have to produce to TPC.

7.4 Performance Evaluation:

- TPCL may depute their representative at site from time to time to check the quality of work being carried out by the contractor. If the quality is not up to TPC standard, contractor may have to redo the work at no extra cost.
- Penalty will be levied to contractor against violation of safety requirements as per Contractor Safety Management (CSM) policy of TPC.
- No safety violation will be entertained, and strict action will be taken, in case of violation.
- Monthly performance will be tracked, and contractor has to take necessary action against feedback shared by TPC.

7.5 Contingency Plan:

- Leave intimation for vendor depute resident engineer should be given at least one week in advance to TPC.
- Replacement has to provided in the leave duration.

7.6 SAFETY Performance Measures:

- There shall not be any accident due to non-adherence of safety practices. (Vendor rating shall be reduced by 20% for every such incident.)
- Number of noncompliance of wearing safety PPE should be nil.

- Any employee found to be violating safety practices on more than two occasions shall be terminated with immediate effect. In addition, vendor rating of contractor shall be reduced by 10% for every such termination.
- If the contractor rating falls below expected level due to non-adherence of safety norms, Contractor will not be eligible for extension of contract.

7.6.1 Behavioral Requirements:

- Punctuality
- Trustworthy
- Integrity
- Customer friendly
- Risk averseness
- Politeness & behavioral etiquettes.
- Keen learner of new technology/Process/Application.

7.6.2 Scope of Contractor's Liabilities:

- Any unforeseen accident of contractor’s employee while travelling or third party claim.
- Any financial Liabilities arising out of accident to the contractor’s employee.
- Consequential expenses due to misbehavior with customer or public.
- All kind of financial issues like salary/incentive/medical etc. will be in contractor scope.
- Cost of TPSDI training (L1 and L2 Training) will be in the contractor's scope.
- Any damage to consumer's or TPC or any other property will be in scope of contractor.

7.7 Note:

7.7.1 The designated officer of Tata Power shall verify and certify the invoice.

7.7.2 All SLA are to be calculated over calendar month.

7.7.3 One end point consider for a penalty in one parameter will not be consider for penalty for another parameter.

7.7.4 Penalty may be waived, if the reason is beyond control of contractor and same needs to be validated by TPC.

7.7.5 For SLA calculation all exceptional cases not attributable to Contractor like – power failure, power quality, sabotage will be excluded from the calculation.

7.7.6 The Bidder shall furnish the success report as per SLA along with the payment invoices. The MDMS should have such feature to get date and time wise report of each point. Payment will be done subjected to compliance of SLA.

7.7.7 Bidder shall maintain and present MIS against each penalty clauses with sufficient backup data. Same shall be validated by TPC team before clearing the invoice.

7.7.8 The designated officer of TATA POWER shall verify and certify the invoice through system generated reports; bidder shall provide an interface for verification of the invoice in the software to facilitate the verification authority to compute the availability of meter data on system and amount of applicable penalty.

7.7.9 There will be penalty of Rs 100 /AMI NIC card / Day for non-communicating for more than 15 days.

7.7.10 Bills/Invoice will be submitted online/offline on monthly basis, as per TPC process.

7.7.11 Payment shall be made based on actual work done in a month that will be verified by TPCL.

7.7.12 Payment will be done basis on actual work carried out in each category.

7.7.13 Billing quantity will be verified by TPC before proceeding for payments to vendor by TPC.

7.7.14 All invoices shall be submitted on time, any delay in payment will be contractor's responsibility.

7.8 Penalty

7.8.1 Bidder is expected to maintain the remote availability of readings to 100%. However, penalties will be levied on monthly FMS invoice in case it drops. The following operational penalties shall be applicable on the Bidder and shall be calculated as here under:

Sr. No.	Particular	Extent of penalty / No Payment
1	Up to 97%	No penalty
2	Below 97% and up to 80%	No payment towards non-reporting consumer Meters. Additionally, penalty @ of percentage by which the SLA falls below 97% shall be deducted from the monthly invoice of the vendor.
3	Below 80 %	No payment shall be made

7.8.2 **Additional Penalty Clause:**

Key service requirement	SLA parameter	Penalty /Reward
Completion of any additional request from field (like FOTA/TOD Change/ Config Change etc.)	100% Compliance	Penalty of Rs. 50/ meter/day after 3 days of formal TPC request.
Repeated instances of mass communication failure (> 5% of total installed base)	100% compliance	Penalty of INR 5,000 for first repeat instance. Afterwards INR 10,000 for every repeated incidence.
Availability of accurate data in HES and MDMS	99.5%	Penalty of 5000 for every percentage dop in availability.
Availability of systems on 1st with	100% compliance	Penalty of 10000 for every instance.
Carrying out the modification job in HES and MDMS	100% compliance	Penalty of 1000/day after the completion of pre-agreed timelines.

Submission of proper MIS and supporting files for calculation of penalty	100% compliance	Penalty of 1000 for every instance.
Use of PPE if applicable	100% compliance	A penalty of INR 5000/- will be levied for each instance of non-use of PPE.
Behavioral conduct of contractor employee.	In case of reporting of misbehavior from any of the concerned parties like TPC, customers, TPC employee, etc.	Penalty of Rs.5,000/- shall be charged for every instance of non-compliance.
Repeated Behavioral conduct of contractor employee.	In case of reporting of misbehavior from any of the concerned parties like TPC, customers, TPC employee, etc.	The contractor associate will be suspended at least for one week or terminated, if repeated incident reported.
Violation Of Instruction	100% compliance	Penalty of INR 1,000/- shall be levied for every instance of non-compliance.
Late reporting and leave without prior intimation	100% compliance	Penalty of INR 1,000/- shall be levied for every instance of non-compliance.
One-week prior intimation for leave greater than one day.	100% compliance	Penalty of INR 1,000/- (per day) shall be levied for every instance of non-compliance.
Reporting of leave - all leave related intimation should be from identified vendor manager only.	100% compliance	Penalty of INR 1,000/- (per day) shall be levied for every instance of non-compliance.
Timely Submission of Monthly Gate pass	100% compliance	Penalty of INR 1,000/- shall be levied for every instance of non-compliance.
Accuracy in assigned activities/task	100% compliance	Penalty of INR 1,000/- shall be levied for every instance of non-compliance.

Ethical Behavior	100% compliance	Penalty of INR 10,000/- shall be levied for every instance of non-compliance and responsible Contractor associate will be terminated with immediate effect
Daily submission of MIS	100% compliance	Penalty of INR 500/- shall be levied for every instance of non-compliance.
Priority cases should be attended within same day and as per TPC instruction	100% compliance	Penalty of INR 500/- shall be levied for every instance of non-compliance.
Intimation to TPC for any discrepancy, hurdle, problem Etc. on time	100% compliance	Penalty of INR 500/- shall be levied for every instance of non-compliance.
Loss of meter data	100% compliance	Penalty of FMS charges for the number of months for which data is lost multiplied by nos. of meters.
Compensation to be done by contractor associates for any incident, accident, property damage to TPC, consumer, third party etc. at site.	100% compliance	Entire cost of damage, repair, etc. will be recovered from contractor. All replacement, rectification, compensation will be done by contractor.
Repeated any incident of non-conformance.	100% compliance	The contractor associate will be suspended at least for one week or terminated, if repeated incident reported.
Prior intimation to TPC before reporting at site or leaving the site.	100% compliance	Penalty of INR 1,000/- shall be levied for every instance of non-compliance.
Adherence of ABAC (anti-bribery and anti-corruption) policy	100% compliance	The contract and contractor associates will be terminated with immediate effect.
Security breach/ threat.	No security breach is acceptable	The contract and contractor associates will be

		terminated with immediate effect.
Cyber security	100% compliance	The contract and contractor associates will be terminated with immediate effect if any incident/ instance reported.

8 Training Requirements

8.1 General requirement for training

8.1.1 Training shall be conducted by Bidder personnel who are experienced instructors at no extra cost to TATA POWER.

8.1.2 The bidder shall provide training to various user groups nominated

8.1.3 The bidder shall provide the Training Approach in the response

8.1.4 All necessary training material shall be provided by the Bidder. Each trainee shall receive individual copies of documents used for training. Training material shall be organized by functional process that will serve as the training documentation for a particular functional area.

8.1.5 Training materials, including the documents provided to the trainees as well as handouts, shall become the property of TATA POWER. TATA POWER reserves the right to copy such materials, but for in-house use only.

8.1.6 For all trainings the travel expenses (if any) will be borne by TATA POWER. It will be prefer to have the training arranged at TPC, Mumbai.

8.1.7 The schedule, location, detailed contents, for each course shall be finalized during detail engineering. The number of participants in the training program may undergo change. However, all the training courses shall preferably be conducted in single batch.

8.1.8 The training will consist of a curriculum of courses to address the issues of system operation, business-wide application, changed business processes and general use of the new system.

8.1.9 Representatives from the bidder and project management teams will be involved throughout in the development of training strategy, training material design and development, standards and training delivery to ensure that change management issues are incorporated, and that training strategies and materials are aligned to the requirements of the project and as business specific as possible.

8.1.10 In addition, two Engineer's from TATA POWER shall be stationed at the bidder's works during development/customization of solution as per tender. The deputed engineers shall be involved with the project till its completion.

8.1.11 The training modules shall include but not limited to –

- AMI Administration & Configuration
- AMI Installation and Troubleshooting
- Application Management
- Application Data Analysis

8.1.12 The bidder shall be required to organize Professional and End User Training for the TATA POWER personnel.-

8.2 Professional Training

8.2.1 This is the training for the core group of implementation team. This team will comprise of members from all the Business Functions and IT sections. Each member would be trained in the relevant function/ module.

8.2.2 This Training would be required to be given to approximately 10 personnel.

8.2.3 It is the responsibility of bidder to deliver this training. Standard curriculum, designed and agreed by TATA POWER for hardware, software and network preferably shall be arranged by the bidder for each group.

8.2.4 TATA POWER will prefer if a portion of the training is conducted on-site.

8.3 End User Training

8.3.1 The bidder will provide training to TATA POWER team on a "Train the Trainer" basis.

8.3.2 TATA POWER team so trained will then train all of the end users. It is estimated that this training will require around 10 groups, with each group comprising of around 5 persons.

8.3.3 The recommended training material can be in paper / electronic media with courses on Business Process Automation software fundamentals, business process overview, job activity training, and delivery options being on-line, CBTs, instructor led class rooms, etc.

9 Special Requirement of the Project

9.1 Bidder shall design the proposed system considering the TATA POWER licensed area consumer base, geographical conditions and future requirements.

9.2 The offered solution shall have minimum life cycle of 7 years.

9.3 All software licenses provided by bidder should be perpetual with 7 years of warranty from date of sale to TATA POWER. Bidder shall provide free upgrades during warranty period of licenses.

9.4 TATA POWER intends to design the system, Telecom Service Provider and Meter manufacturer agnostic and the ability to support hybrid communication technologies.

9.5 TATA POWER may procure the Smart Meters from more than two Meter Manufacturers as per requirement, the proposed system shall design to accommodate multiple makes of Smart Meters.

9.6 The bidder shall ensure the possibility of up-gradation of the Firmware / software in the communication modules/Smart Meter from remote from time to time to meet the increasing demand of the system in operation / overcoming system limitations / bugs.

9.7 The bidder shall also ensure incorporation of new hardware (communication devices, meter, NIC), if required, in future. The bidder therefore shall ensure that all such upgrades shall seamlessly fit into the existing end to end system in operation and shall be backwardly compatible to the earlier generation devices / software / Firmware in operation to guard against obsolescence at no cost to TATA POWER.

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

9.9 As the proposed system will be integrated with different IT-OT system of TATA POWER (SAP, ADMS, Solar, SAP, OMS, GIS, FFA); to ensure interoperability with these systems, any upgrade required in the hardware/software (including 3rd party items) of proposed solution shall be the responsibility of bidder during the entire warranty and post warranty maintenance period.

9.10 Specifications of hardware shall be provided along with bid and Manufactures authorization for warranty & guarantee shall be in Name of TATA POWER.

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

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

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

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

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

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

9.17 All the supplied AMI system components including Smart Meters shall have the warranty of 7 Years. Any deviation from the same may attract warranty loading during tender evaluation.

9.18 Bank Guaranty period shall match the equipment warranty period.

10 SLA for Smart Meter System

10.1 These performance levels shall apply to the complete Smart Meter system.

10.2 Smart Meter system include the communications links provided by Network Provider /third parties such as telecommunications companies and bidder have to ensure the desired performance level.

10.3 The performance levels exclude force majeure events.

10.4 The following are the required performance levels for an AMI Systems which should be met on a daily basis

Data Type	Performance Requirement
1. Scheduled Interval data readings at a fixed periodicity during the day	
Periodic collection of the 15/30-minute interval load profile data after every 15/30 minutes for entire population.	From 97% of meters within 5 minutes
	From 99% of meters before next periodic packet is scheduled.
2. Scheduled daily load profile(midnight) / Billing profile readings	
Daily collection of the daily load profile & monthly billing profile for energy data and total accumulated energy for entire population.	From 97% of meters within 6 hours after midnight; and
	From 99% of meters within 24 hours after midnight
3. Scheduled billing profile data for bill period	
Collection of daily load profile/monthly billing profile data on the bill date for entire population.	From 97% of meters within 4 hours after midnight; and
	From 100% of meters within 24 hours after midnight
4.Instantaneous reads of meters	
Collection of instantaneous readings after every one hour for entire population.	From 97% of meters within 10 minutes
	From 99% of meters before next periodic read is scheduled.
5. On-Demand / Scheduled on requirement Remote reads of meters	
Collection of entire data available in meter for interval/daily/monthly/instantaneous/event/any other profile data and the current total accumulated energy for entire population.	Action performed at 95% of meters within 2 hour; and
	Action performed at 99% of meters within 6 hours; and
	Action performed at 99.9% of meters within 24 hours
Collection of entire data available in meter for interval/daily/monthly/instantaneous/event/any other profile data and the current total accumulated energy for individual meter	Action performed within 30 seconds
6. Updating of data on consumer portal/ app	

Two-way transfer data on portal/ app /api after receiving the data in MDMS for entire population	Action performed for 99% consumers within 30 minutes after receiving the data in MDMS
	Action performed at 99.9% of meters within 2 hours after receiving the data in MDMS.
7. Ping/Telnet Response with acknowledgement/ response for selected meters	
For entire population	Action performed at 99.9% of meters within 1 minute; and
For an individual meter	Action performed on all meters within 3 seconds
8. Remote load control commands for selected meters with acknowledgement/ response for selected meters	
For entire population	Action performed at 95% of meters within 5 minutes; and
	Action performed at 99% of meters within 10 Minutes
For an individual meter	Action performed within 5 seconds
9. For remote connect/disconnect with acknowledgement/ response for selected meters	
For entire population	Action performed at 90% of meters within 5 minutes; and
	Action performed at 99% of meters within 10 minutes; and
	Action performed 99.9% of meters within 20 minutes
For an individual meter	Action performed within 30 seconds
10. Meter loss and restoration of supply	
Receiving of alert for all affected AMI meters	Alert to be received within 2 minutes for 99% of meters
11. Meter Tamper Alerts	
Receiving of alert for an individual meter	Alert to be received within 2 minutes
12. Power Quality Alerts	
Receiving of alert for an individual meter	Alert to be received within 5 minutes
13. Remotely altering settings in meter/ firmware upgrade with acknowledgement/ response for selected meters	
For entire population	Action performed at 98% of meters within 30 minutes; and
	Action performed at 99.9% of meters within 1 hour
14. Event log display	
For reading the event/alarm log for entire population	System should display 100% all event ON logs for all meters. Alarms shall be coming on real time basis as occurred on field for 100% communicating meters.
15. Remotely read events logs	

For reading the full event log for entire population	Action performed at 90% of meters within 30 minutes; and
	Action performed at 99% of meters within 1 hour; and
	Action performed at 99.9% of meters within 6 hours.
16. Meter discovery timeline after installation	
For discovery of meter after installation at site and configuration in HES and MDMS	From 95% of meters within 6 Hrs
	From 99.9% of meters with in 24 Hrs

10.5 For the above performance requirement, a designated team/ person from TATA POWER will review the performance of Bidder against the SLA after every 30 days.

10.6 Post evaluation, an audit report of the same will be submitted by the Bidder to the TATA POWER. Further, for meeting SLAs as defined above (except SLA number 4), MDMS should be able to generate standard reports for these parameters.

10.7 During performance evaluation, the generated reports shall be randomly checked with data by the designated team/ person from Tata Power.

10.8 The performance level for generation of billing determinants by the MDM would be as defined by Tata Power.

10.9 Bidder shall be required to develop reports in MDMS to evaluate the SLA. Overall SLA will be calculated on the basis of aggregated weightage of all individual SLA lines. Weightage of individual SLA/ exclusion of the same to be done as per requirement of Tata Power in the auto generated report.

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

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

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

- The user interface performance testing shall be taken by TATA POWER after every 30 days in presence of the Bidder. An audit report of the same will be submitted by the Bidder to TATA POWER.

Document	**Prepared By**	**Reviewed BY**	**Approved By**
Name	Rajrupa Chattopadhyay	Ajit A More	Devanjan Dey
Sign			
Date	11-07-2023	11-07-2023	11-07-2023

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	18.07.2023
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

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 $\pm$ 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 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 200L*210W*100D
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
4.44	GPS Tracking System	Meter shall preferably have inbuilt GPS tracking device and appropriate system to check exact live location of meter.

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. Res: Vph > 191V (Independent of current)	5	5
2	Voltage unbalance	YES	25	Occ : (Vmax-Vph)>10% Vn and Vphase : 191>Vphase< 216 Res : (Vmax-Vph)<10% Vn and Vphase : 191<Vphase> 216	5	5
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 Res: Ir+Iy+Ib+In<5% of Ib(vector Sum) and phase current>10% Ib with all current are positive	30	30
5	Current unbalance	YES	25	Occ : Imax – Imin > 30% of Iavg Res : Imax – Imin < 30% of Iavg	15	15
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 Res: Ir+Iy+Ib+In>2.5% of Ib(vector Sum) and phase current<10% Ib with all current are positive	30	30
7	Current reversal	YES	25	1. Active current negative 2. PF > 0.3	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	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 60 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 100 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 120 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.

Bidder has to provide meter guarantee for 120 months. In case bidder fails to comply the same requirement, loading factor will be added as below-

Calculated meter cost = negotiated cost by bidder * Loading factor
Formula of loading factor= 1+ (0.02*a)
Where, a = (warranty years as per specification - warranty years given by OEM)

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		
65	GPS Tracking Device		

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

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.	03	Revision Date	18.07.2023
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

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
4.45	GPS Tracking System	Meter shall preferably have inbuilt GPS tracking device and appropriate system to check exact live location of meter.

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 60 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 100 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 **120** 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.

Bidder has to provide meter guarantee for 120 months. In case bidder fails to comply the same requirement, loading factor will be added as below-

Calculated meter cost = negotiated cost by bidder * Loading factor
Formula of loading factor= 1+ (0.02*a)
Where, a = (warranty years as per specification - warranty years given by OEM)

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		
64	GPS Tracking Device		

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:

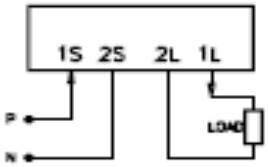
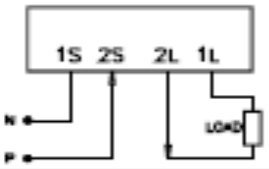
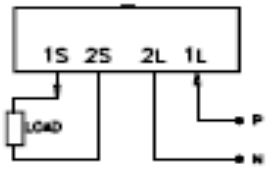
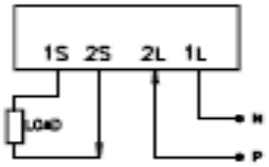
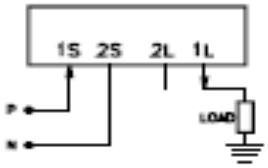
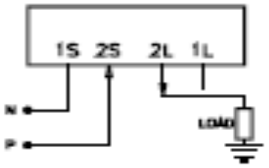
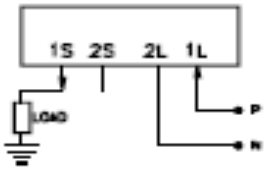
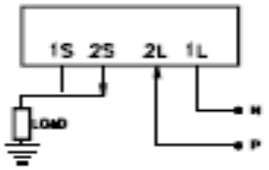
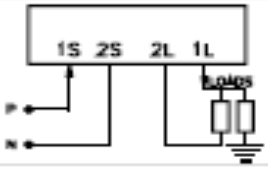
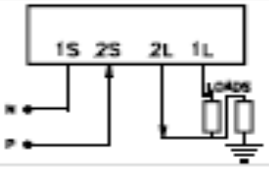
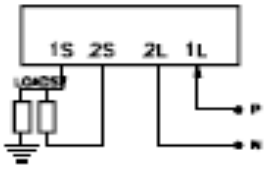
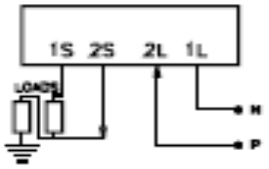
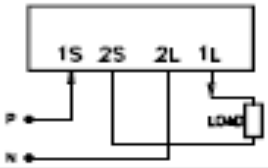
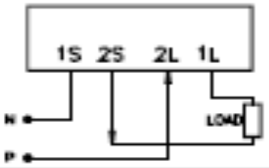
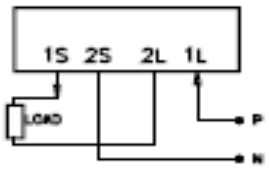
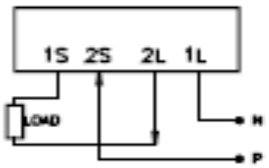
S.No.	Clause No.	Details of deviation with justifications

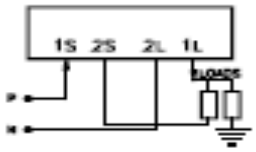
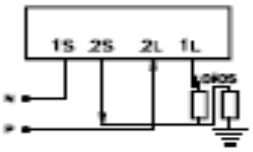
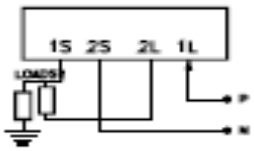
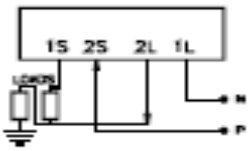
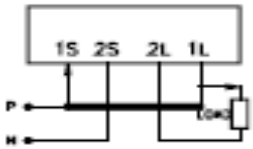
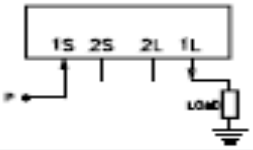
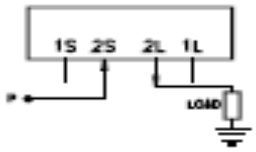
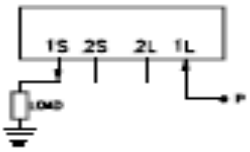
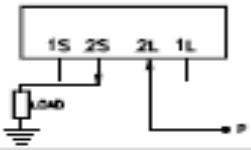
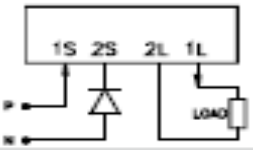
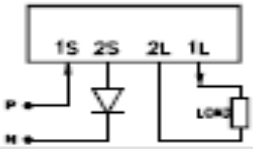
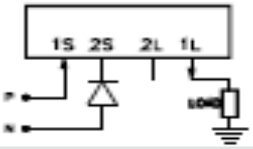
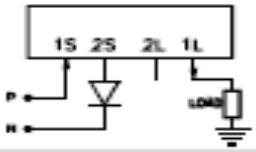
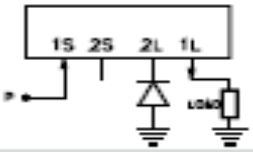
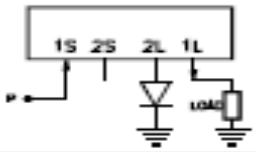
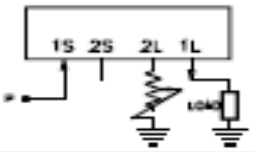
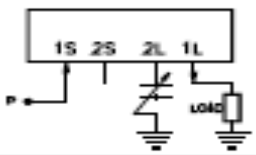
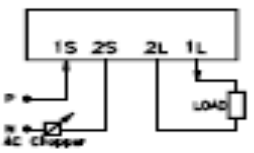
We confirm that there are no deviations apart from those detailed above.

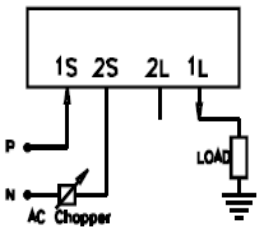
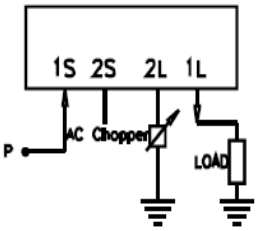
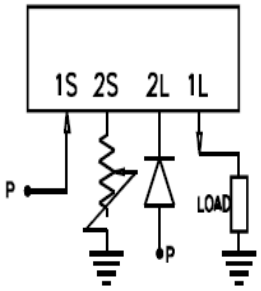
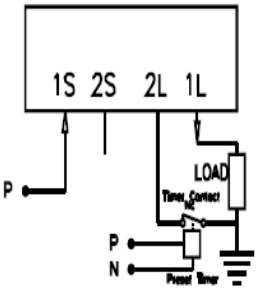
Seal of the Company.

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 0.5s, -/5 Amp,

HT TRI-VECTOR

Smart Meter

Tata Power Company Ltd.

Meter management Department

Dharavi Receiving Station,

Matunga,

Mumbai – 400 019

Document No.	TPC\MTL\HTCT\2023\01	Issue No.	01
		Issue Date	18.07.2023
Revision No.	--	Revision Date	--
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

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*63.5 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 = 63.5 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	D4 - The same shall be displayed in BCS
4.45	GPS Tracking System	Meter shall preferably have inbuilt GPS tracking device and appropriate system to check exact live location of meter.

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 (63.5V) 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 <57V: and current > 2% Ib. Res: Vph > 57V (Independent of current)	5	5
2	Voltage unbalance	YES	25	Occ : (Vmax-Vph)>5% Vn and Vphase : 57<Vphase< 69 Res : (Vmax-Vph)<=5% Vn and Vphase : 57<Vphase< 69	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	30	30

				Res: CT bypass <20% Ib		
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 (Immediate)	NO	25	OCC: On removal of card RES: On Inserction card	Immediate	Immediate
15	Power On/Off	NO	25	Occ: Actual voltage OFF	5	5

				Res: Actual voltage ON		
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 (63.5V) 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 60 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. 100 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 cumulative Kwh
Defrauded Energy cumulative Kvah
Cumulative 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 **120** 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.

Bidder has to provide meter guarantee for 120 months. In case bidder fails to comply the same requirement, loading factor will be added as below-

Calculated meter cost = negotiated cost by bidder * Loading factor
Formula of loading factor= 1+ (0.02*a)
Where, a = (warranty years as per specification - warranty years given by OEM)

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 voltag 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		
65	GPS Tracking Device		

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

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	18.07.2023
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.	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.	18.07.2023	Rahul Ranadive & 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
4.44	GPS Tracking System	Meter shall preferably have inbuilt GPS tracking device and appropriate system to check exact live location of meter.

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 (Immediate)	NO	25	OCC: On removal of card RES: On Inserction card	Immediate	Immediate
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 60 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. 100 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 **120** 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.

Bidder has to provide meter guarantee for 120 months. In case bidder fails to comply the same requirement, loading factor will be added as below-

Calculated meter cost = negotiated cost by bidder * Loading factor
Formula of loading factor= 1+ (0.02*a)
Where, a = (warranty years as per specification - warranty years given by OEM)

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 voltag 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		
65	GPS Tracking Device		

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:

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.

RFQ No.: CC24VKD001

ANNEXURE VIII

General Conditions of Contract

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!

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

Appendix 3:
Safety Terms and Conditions

Reason for Change	Date of Last Revision	Prepared By	Reviewed By	Approved by
1.Simplify the procedure 2.Addition of capability building 3.Removal of CFSA 4. Addition of Environment KPI 5.Retention amount is based on Risk involved in Job	11 May 2015 -R1 10 January 2022 -R4	Rajesh Sharma *(Head-Safety Generation)*	Monish Kumar (Chief Corporate Contracts)	Suresh H Khetwani (*Chief safety and Environment*) 14/01/2022

1 Definitions

1.1. **Order Manager:** Order Manager is the Tata Power representative, who has the ownership of the given job.

1.2. **Site Safety Management Plan**: It is the safety plan agreed between Contractor and Tata Power. It will contain the entire job specific safety requirement and will be signed by the contractor.

1.3. **Contractor**: An individual or a company that provides services to Tata Power under a signed contract.

1.4. **Emergency:** a serious, unexpected, or dangerous situation requiring immediate action, which may result in loss of revenue/property, business discontinuity. In case of Emergency*, services may be procured by selecting the qualified vendor based on the vendor category without the safety bid evaluation. It must be approved by MB level and above.

1.5. **Expert Service jobs:** Jobs which needs expert services of contractor which does not involve direct exposure to the potential risk or work which involves only supervisory work such as expert for turbine overhaul, expert for boiler overhaul, expert for pump and motor, expert for compressor overhaul.

1.6. ***CEO/Chief/Head of division/Unit/Utility*:** Business in charge of the division who is overall custodian of the generating station or transmission division or distribution division.

1.7. **Category A Vendor:** Vendor eligible to carry out Very High & High risk (as per Tata Power Hazard Identification and Risk Analysis Procedure) and /or Long-Term Contract related to operation and maintenance (O&M) of plant. Vendors must fulfil the requirement specified for Category A in Appendix 12-CSMF-5 of Contractor Safety Code of Conduct document. Any vendor wants to registration under Category -A shall have ISO 45001/OHSAS 18001 Certification from accredited agency recognised by Tata Power .

1.8. **Category B Vendor:** Vendors eligible to carry out technical jobs, that are classified under Medium /low risk. Vendors must fulfil the requirement specified for Category B in Appendix 12-CSMF-5 of Contractor Safety Code of Conduct document. Any Vendor/Contractor wants to registrar under Category-B shall have ISO 9001 Certification from accreditation agency recognised by Tata Power.

1.9. **Category C Vendor:** Vendors eligible for to carry out low or very low risk administrative and office jobs. For this he must fulfil the requirement specified for Category C in Appendix 12-CSMF-5 of Contractor Safety Code of Conduct

document. Any Vendor/Contractor wants to registrar under Category-C shall have ISO 9001 Certification from accreditation agency recognised by Tata Power.

1.10. **Category D Vendor:** Consultants, Medical Practitioners or vendors taking job from Tata Power and working from their own premises (e.g., motor rewinding at vendor's own shop floor etc.) are classified as Category D Vendor

1.11. **High/Very High-Risk Jobs** A Job or its activities are considered as Very High or High Risk when Order manager apply the "Tata Power Hazard Identification and Risk Analysis" procedure and found safety risk associated with are under Very High or High category. Indicative lists of jobs are given in appendix 15 of this document.

1.12. **Medium Risk Jobs:** Jobs or its activities are considered as medium risk when Order manager apply "Tata Power Hazard Identification and Risk Analysis" procedure and found the same as Medium Risk.

1.13. **Low/*Very low* Risk Jobs:** Any job or its activities are considered as Low or Very low risk while Order manager, calculate it by applying "Tata Power Hazard Identification and Risk Analysis" procedure and found it under Low or Very Low category.

1.14. **Long Duration Jobs:** When the duration of job is 12 months or more, it is considered as Long duration job

1.15. **High Value Jobs:** When the value of the job contract is Rs. One Crore or more it will be considered as High value job.

2 Health and Safety Policy

TATA

HEALTH AND SAFETY POLICY

Tata Power is committed to provide safe and healthy working environment for the prevention of work related injuries and ill-health. Safety is one of our core values. We strive to be a leader in safety excellence in the global power and energy business. In pursuit of this, we are committed to the following:

- **Maintain and continually improve our management systems to eliminate hazards and reduce health & safety risks to all our stakeholders.**
- **Incorporate appropriate health & safety criteria into business decisions for selection of plant and technology, performance appraisal of individuals and appointments in key positions.**
- **Comply and endeavour to exceed all applicable health & safety legal and other requirements**
- **Integrate health & safety procedures and best practices into every operational activity with assigned line-functional responsibilities at all levels.**
- **Involve our employees and business associates in maintaining a safe and healthy work environment through consultation and participation**
- **Inculcate safety culture by visible leadership and empowerment.**
- **Ensure required competency to enable our employees and business associates for working safely.**
- **Promptly report incidents, investigate, share crucial learnings and prevent recurrences.**
- **Influence our business associates in enhancing their health and safety standards and align with Tata Power's health & safety codes and practices.**
- **Set safety & health metrics as indicators of excellence, monitor progress and continually improve health and safety performance.**

We shall ensure the availability of appropriate resources at all times to fully implement and communicate this policy to all stakeholders by suitable means and periodically review its relevance in continuously changing business environment.

(Praveer Sinha)
CEO & Managing Director

Date: 11th March, 2019

TATA POWER

Lighting up Lives!

3. Safety Organization & Responsibilities

3.1 Contractor Site Management and Supervision

Each Contractor will be responsible for fulfilling all statutory and safety requirements as per the laws of the land and not limited to Factory Act, Electricity Act, Electricity Rules and Regulations, Shop and Establishment Act etc.

Each Contractor shall provide at least one competent full-time safety supervisor for workforce of every 50 workers or less than that. When workforce ranges to 500, the contractor must provide at least one qualified safety officer. Thus, for work force of 500 workers there will be one qualified safety officer and 10 safety supervisors. For every 500 addition in workforce, the contractor must add 1 safety officer and 10 safety supervisors. The Tata Power Project Safety Manager will review and approve the appointment of all safety officers and supervisors. Contractor/Subcontractor safety supervisors/officers will work with Tata Power Safety Managers and align themselves with Tata Power safety requirements.

Each Contractors'/Subcontractors' Site Manager is responsible, and will be held accountable, for the safety of their own workforce as well as workforce of sub-contractors. He should also ensure that all equipment, materials, tools and procedures remain in safety compliance at job site, including:

3.1.1 Holding officer/supervisors accountable for safety and actively promote safe work performance.
3.1.2 Participate in and cooperate with all safety program requirements to be implemented in order to meet Tata Power safety objectives.
3.1.3 Ensure timely reporting of safety incidents, near misses, unsafe acts and conditions.
3.1.4 Identify the training needs of its employees and maintain all safety training documents.
3.1.5 Provide safety performance report at an agreed frequency.
3.1.6 Stopping of unsafe work (acts and/or conditions) immediately, until corrective action be taken.
3.1.7 Perform daily toolbox talk for all the jobs
3.1.8 Ensure only tested and certified tools and equipment is issued to workers.

3.2 Contractor Supervisors and General Staff

Contractors' site supervisors and general staff members in charge of job site functions such as field engineering, warehousing, purchasing, cost and scheduling, etc. are responsible for the safe performance of the work of those they supervise. They must set an example for their fellow employees by being familiar with applicable sections of the Site Safety program and ensuring that all site activities are performed with SAFETY as the primary objective.

Each site supervisor is responsible and will be held accountable for identifying, analyzing and eliminating or controlling all hazards through implementation of an aggressive, pro-active Health, Safety and Environmental Program. Each supervisor will proactively participate in the SHE programs by observing, correcting, and recording unsafe acts and conations at plant / sites.

3.3 Contractor Workforce

Site Safety Officer/Safety Supervisor / Safety Coordinator shall be interviewed by the order manager/ safety head of the division and then gate passes shall be issued.

All the contractor employees shall attend "SHE L0 or L1 Foundation Course in Safety". Depending on the critical procedure in job employees shall also be required to attend "SHE L2 course of critical/high risk operations". All Supervisors shall be required to attend "SHE L3 Supervisory Training". All the above trainings will be conducted by TPSDI or other equivalent institute approved by Tata Power.

Contractor employees shall be required to attend any other additional training if suggested by Order Manger or Site Safety Head.

Contractor / Vendor shall mobilize their manpower well in advance to complete the training through TPSDI.

Welder/electricians/fitters/radiographer/rigger mobilized by the Contractor shall have valid competency certificate issued by the authorized agency / institute.

Contractor workforce must make safety a part of their job by following safety rules and regulations and by using all safeguards and safety equipment. They must take an active part in the Plant /Site's Safety program.

Every member of the workforce is expected to report for work without influence of any Drug/Alcohol.
All employees shall report hazardous conditions, practices and behaviors in their work areas and correct wherever possible.

Workforce is responsible for active participation in safety and health programs, suggestion systems, trainings and reporting of unsafe practices, Unsafe conditions incidents and injuries to their supervisors.

3.4 Vendor/Contractor/sub-contractor

Vendors/Contractor shall always comply with and ensure that their workforce comply with all site safety rules and regulations. Specifically, with applicable provisions of the Tata Power Site Safety Management Plan and all statutory safety rules and regulations.
After receiving the work order/ purchase order vendor/contractor/bidder shall not appoint Sub-contractor without safety assessment of the sub-contractor through safety concurrence group Under Contractor Safety Code of Conduct. Penalty of 5% of contract value will be applicable to the contractor if subcontractor is appointed without the permission of SCG and without evaluation through CSCC process.

4 Site Safety Rules and Procedures:

The work in the safest possible manner can only happen when it has been carefully planned and all applicable procedures are followed. The Tata Power Safety Procedures are derived from Tata Power best practices and the applicable Government acts regulations. In each case, the most stringent regulation is used.

4.1 Requirement of Tools and Tackles

- Tools & Tackles used to carry out the job shall be checked and inspected by Order Manager and safety Officer.
- Vendor must submit a valid Certificate from Competent person under the Factories Act 1948 and State Factories Rule for all Lifting Tools and Tackles (like Hoist, D Shackles, chain Block, wire ropes etc.).
- All Electrical Hand Tools must be tested for leakage of current by a person /agency authorized by Tata Power. Electrical power must be taken though RCCB of 30mA. Electrical hand tools should not have cord more than 3 meters in length. If power source is at more than 3 meters, extension boards with RCCB of 30 mA and ON/OFF switch, shall be used.
- Removal or inclusion of tools any new tool /tackles / machinery / equipment at site should only be done with concurrence of the order Manager / Head Officer.

4.2 Critical safety Rules and Procedures

Following is the list of Tata Power's critical Safety Rules and Procedures. Contractor shall refer to approved Rules and Procedures for detailed requirements and ensure conformance.

4.2.1 Lock Out and Tag Out Procedure

This procedure is intended to be used for the protection of Personnel while servicing or performing maintenance on equipment / pipeline / vessel / process systems. This is a general procedure that shall be used as the minimum requirements for isolation of equipment, pipelines, machines, system from all possible sources of hazardous energy and / or material such as Steam, Hot Water, Compressed Air, any other process fluid / chemical energy /Mechanical energy or Electrical energy. For complete procedure kindly refer Procedure Document No. TPSMS/CSP/LOTO/001 REV 01 available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com / sustainability / safety-documents.aspx)

4.2.2 Excavation Safety (Shoring and Sloping) Procedure

This procedure is developed to cover the safe practices required for shoring and sloping in excavation and trenching jobs. This procedure is developed to establish mandatory requirements for practices to protect personnel, property and equipment from hazards associated with above activities. For complete procedure kindly refer Procedure Document No TPSMS/CSP/EXS/002 REV 01 available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.3 Confined Space Entry Procedure

This procedure outlines the steps required to perform the confined space entry and to protect personnel from the hazards of entering and conducting operations in confined spaces. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/CSE/003 REV 01 available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.4 Working at Height Procedure

This procedure describes the rules and procedures to protect employees from the hazards of working at heights.
This procedure is developed to cover the safe practices required for Working at Heights. This procedure is developed to establish mandatory requirements for practices to protect personnel from hazards associated in this area. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/WAH/004 REV 01 available on official website of Tata Power (Link: https://www.tatapower.com / sustainability / safety-documents.aspx)

4.2.5 Heavy Equipment Movement Safety Procedure

Heavy equipment lifting and movement is an activity involving loading, unloading, storage and movement from one place to another including lifting and erection or repairing of equipment with cranes or hoists. Material, machinery and equipment handling operations are being carried out by large capacity cranes and hoists, which make the job safer and faster. This procedure addresses the hazards and precautions associated with such equipment and their use. For complete procedure kindly refer Procedure Document No – TPSMS/CSP/HEMS/005 REV 01 available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.6 Mobile Crane Safety Procedure

Mobile cranes are responsible for many incidents, injuries. Falling loads from mobile cranes pose a severe hazard to operators and nearby workers and property. Many types of cranes, hoists, and rigging devices are used for lifting and moving materials. To maintain safe, appropriate standards must be adhered to and only qualified and licensed

individuals shall operate these devices. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/MCS/006 REV 01. available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.7 Scaffold Safety Procedure

This procedure is developed to provide information on the safe erection, use, dismantling and maintenance of access scaffolding in the workplace. It is developed to establish mandatory requirements for practices to protect personnel from hazards associated with erection, use and dismantling of scaffolds. For complete procedure kindly refer Procedure Document No –TPSMS/CSP/SCAF/007 REV 01
available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.8 Electrical Safety Procedure

The objective of these standards is to specify minimum mandatory requirements and advisory guidance for identifying and controlling hazards to ensure 'Zero Harm' regarding operation maintenance and testing of electrical equipment. For complete procedure kindly refer Procedure Document No- TPSMS/CSP/ELEC/010 REV 01
available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.9 Job Safety Analysis (JSA) Procedure

This objective of this procedure is to have a task-based risk assessment process in place that identifies, evaluates and controls the risks associated with work activities, and as a result, prevents those involved in the task or those potentially affected by the task, from being harmed. For complete procedure kindly refer Procedure Document No-TPSMS/CSP/JSA/009 REV 01
available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.10 Fire Safety Management Procedure

Objective of This standard is to specify the minimum mandatory requirements and advisory guidelines to ensure prevention of fire related incidents and managing / controlling their impacts if they do occur. For complete procedure kindly refer Procedure Document No (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.11 Permit to Work Procedure

Given the inherent hazards of the power generation and distribution industry, a significant number of TATA POWER operations and installations are critical. Work Permit (WP) System is an essential element in controlling the workplace risks in an effective manner.

For complete procedure kindly refer Procedure Document No –TPSMS/CSP/PTW/008 REV 01
available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.12 Lift (Elevator) Safety Procedure

To provide safe operating procedure for taking control of lift car before entering and existing the pit of OTIS make elevators. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/LIFT/001 REV 01
available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.13 Working on conveyor belt Procedure

This procedure is developed to cover the safe practices required for Working on live equipment and to protect personnel from hazards associated with it. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/CONV/002 REV 01 available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.14 Handling Hazardous Materials Procedure

This Procedure is developed to provide procedure for recycling and / or safe disposal of used / waste batteries in compliance with all legislation. For complete procedure kindly refer Procedure Document No-TPSMS/GSP/HAZM/003 REV 01
available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx)

4.2.15 Material Handling and Storage Procedure:

The purpose of this document is to provide procedures to assist the safe handling of materials (manual handling and mechanical handling). For complete procedure kindly refer Procedure Document No – TPSMS/GSP/MATL/004 REV 01 available on official website of Tata Power (www.tatapower.com) (Link: https://www.tatapower.com/sustainability/safety-documents.aspx).

4.2.16 Contractor Safety Management Procedure

The purpose of this document is to engage with contractors in a way to create safe work environment for everyone working for Tata Power. For complete procedure kindly refer Procedure Document No – TPSMS/GSP/CSM/015 REV 01 available on official website of Tata Power (www.tatapower.com)

The above procedures will be updated time to time and the updated version of the procedures as well as any additional critical procedure will be available on official website of Tata Power (www.tatapower.com) for your reference.

4.3 Other Conditions:

- No Supervision No work policy should strictly be followed.
- HIRA /JSA as per the job scope must be prepared in detail and submitted along with Site Safety Plan by the successful bidder.
- Personal protective equipment (PPE) must always be checked before use to ensure that they are in good condition and clean. Replace them if necessary.
- All relevant PPE shall be provided by the vendor while working at the site.
- Housekeeping shall be maintained all the time while execution of work. All the unwanted material shall be removed from the site at the end of the day's work. Old/damaged parts if taken out of the system shall be kept at identified placed and it shall be shifted to scrap yard or disposed of as per instruction of order manager.
- Site Safety Plan shall be prepared by successful bidder along with order manger. Appendix 1 to be filled by successful bidder and submitted to Tata Power safety in-charge, before mobilization of team at site and start of the work.

5 Training and Capability Building

Safety Training and capability building of workforce is a major component of safety management program. All training required must be provided and documented as specified by Tata Power and Indian Regulations. Tata Power Safety Manager will audit contractors training and related documentation to assure its adequacy.

5.1 Tata Power Site Safety Orientation

All Tata Power contractor and subcontractor workforce is required to attend Tata Power Site Safety Orientation Training to receive a Safety Training Card, which is required to obtain a Gate Pass to the site, prior to entry.

This Safety Orientation Course will be for duration of minimum half day. The information provided during the orientation will include, but is not limited to following:

1. Job rules, personal safety, and conduct
2. Hazard's reporting
3. Reporting of injuries
4. Emergency procedures
5. Safety Activities and Program including disciplinary measure and incentives.
6. Critical safety procedure relevant to the job

5.2 Capability Building

5.2.1 ***Capability Building.*** Appropriate training such as SHE L0, L1, L2 and L3 shall be completed by job- holder, either supervisor or worker, to do his/her job safely. The skill training is provided through TPSDI and other agencies authorized by Tata Power on the list critical Safety procedures given from 4.2.1 to 4.2.14. Duration of training will be as

specified by Tata Power. These trainings are on chargeable basis and rates are decided by TPSDI and Tata Power from time to time. Contractor shall ensure that concerned workmen are provided with adequate training before he / she can execute the work. An evaluation test will be conducted after the completion of the training. Those employees who meets the minimum required competency will be provided with Certificate (Card), which will be valid for 3 years, post which the workmen must reappear for 1 day refresher training and assessment.

5.2.2 If the workman is not able to qualify the assessment, he/she will be given 3 additional attempts to clear in 3-month time failing which he/she will not be allowed to work in Tata Power.

5.2.3 Recognition to the Prior Learning (RPL) in Safety: If "Order Manger" recommends and "Head of the Safety Department of division" is satisfied with the safety knowledge and competency of the employee of contractor a test (RPL) may be conducted by TPSDI / other recognised institute to assess the prior learning in safety. If employees of the contractors will pass in such test, he will be exempted from appearing in SHE L1 training.

5.2.4 Quarterly Revalidation Test: After every three months, "SHE L1 Revalidation test" will be conducted for the contractor's employees to revalidate their safety awareness and knowledge.

5.2.5 Order Manager and Safety In charge of the Division/Site /Plant will conduct a Competency Assessment of all workforce, going to be deployed at site / plant for high-Risk job.

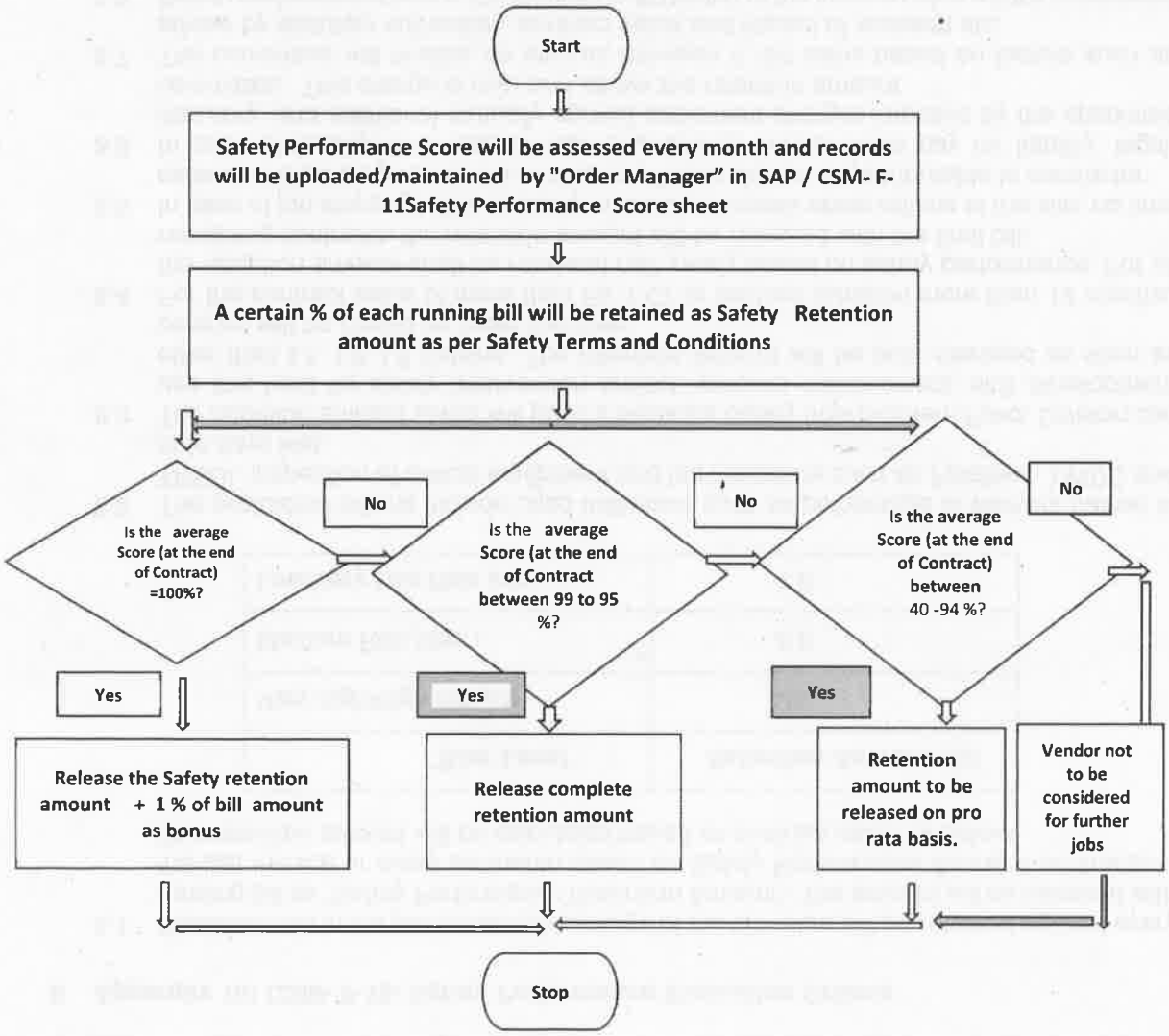
6 Pre-Employment and Periodic Medical check up

Contractor shall arrange to conduct a pre-employment and periodic medical check-up for its entire workforce by Tata Power medical officer or Tata Power authorized medical officer. The contractor shall be able to produce the certificate prior to the employment. The contractor shall also organize to conduct periodical medical checkup (six monthly) for the following category of employees:

- Drivers (Check for Vision & Hearing)
- HEM Equipment Operators (Check for Vision & Hearing)
- Workforce working at Height (Check for Vision, Hearing, Vertigo & Height Phobia)
- Workforce Handling the hazardous substances - Coal, ash and chemicals (Chest X-ray and Lung Function T)
- Workforce in high Noise area (> 90 Decibel), Check for Hearing
- Workforce handling radiography equipment for conducting NDT.
- Workforce, working in specific areas requiring specific medical attention should conduct the medical test as laid down in the respective Site Safety Management Plan.

7 Safety Performance Evaluation and Penalties:

During job execution, regular site inspection will be carried out by the Tata Power officials. Safety violations will be dealt as per CSM–F4 Safety Violation Penalty Criteria. Apart from the above, "Monthly Safety Performance" of the contractor will be evaluated based on the predetermined criteria as per CSM-F11. Safety Performance Score and monthly score will be maintained un-SAP by the Order Manager. Certain percentage of each running bill will be retained as Safety Retention amount and will be released on the basis of Safety Performance Score at certain intervals as defined in CSM- F-3- Safety Performance Evaluation Criteria. Please refer Appendix 10: Process Flow Chart for Safety Performance Evaluation. Percentage of retention amount is also given below:



8 Appendix 10: CSM- F-10- Safety Performance Evaluation Criteria

8.1 Based on risk in the job certain percentage of the bill value will be retained against every running bill as "Safety Performance Retention Amount". The amount will be released with the last invoice or every six-month based on Safety Performance Score of contractors. The retention amount will be calculated based on contract value as below:

Risk Level	***Retention Amount (%)***
Very high/High risk job	*2.5*
Medium Risk jobs	*2.0*
Low/Very Low Risk jobs	*1.0*

8.2 The evaluation criteria include Lead Indicators such as percentage of workers trained in TPSDI, inspection of critical equipment and lag indicators such as Fatalities, LWDC and man days lost.

8.3 The retention amount saved will go to a separate Safety Improvement Fund. Division can use this fund for safety intervention project, process improvement, skill development other than L1, L2, L3 training. The retention amount will be auto released as soon as contract will be closed by order manager.

8.4 For the contract value of more than Rs 1 Cr or contract duration more than 12 months, the retention amount shall be released half yearly based on safety performance. For all remaining contracts, the retention amount will be released with the final bill.

8.5 In case of job stoppage due to safety violations / unsafe observations at the site, no time extension shall be given to the contractor, if such delays are attributable to contractor.

8.6 In case of fatality, limb loss or loss of property, vendor must pay for liability, legal, statutory, and additional mutually agreed settlement charges imposed by the appointed committee. This charge is over and above the retention amount.

8.7 The committee will finalize an amount between 5 -50 lakhs based on factors such as advise by statutory authorities, contract value and impact of accident etc.

8.8 Safety performance bonus 1% (limiting to 50 lakhs) of the invoice value will be considered at the end of the job if the contractual safety performance score 100%.

8.9 During the progress of the work, concerned Supervisor/Engineer will visit and inspect the work site regularly and evaluate the safety performance of the contractor based on matrix attached herewith and apply the Consequence management policy as applicable.

8.10 Order Manager, divisional chief and SBU head have the authority to terminate the contract in case of three consecutive serious violations.

9 Appendix 11: CSM- F-11 Safety Performance Score

Sr. No.	Parameter	Unit of Measurement	Target	Weight age	Actual Performance	Actual Score
Lead Indicator						
1	% of Employee certified in TPSDI/Authorized agency	Number	100%	20		
2	Monthly inspection completed for Critical Equipment, lifting Tools & Tackles and hand tools used at site *by contractor*	Number	80%	15		
3	Condition of critical tools, tackles and equipment *to be checked by order manager*	Number	100%	10		
4	*Safe (designated way) Disposal of Waste generated*	-		*10*		
5	*Records of waste (Hazardous Waste – Oily cotton waste – E- waste etc.) generation*					
6	*No Effluents to drain*					
7	*No effluents/discharges to ground*					
Lag Indicator						
1	Number of Fatalities	No	0	*15*		
2	Number of Lost workday case (LWDC) (reportable)	No	0	10		
3	*Numbers of total reportable cases*	*No*	*0*	*10*		
4	Man-days Lost	Man-days	0	10		
					Final Score	
					Invoice Value	
					Amount to be released	

10 Revised Penalty Chart for Safety Violations (Unsafe Acts and Unsafe Conditions)

Penalty shall be imposed on the contractors under the following circumstances for breaching the contractual agreements:

Sr No	Description of violation	Severit Index	Penalty
1.	Working without Permit	5	5000/-
2.	Untrained (TPSDI) worker on high-risk jobs.	5	5000/-
3.	Unhygienic/Bad condition of PPE	2	250/-
4.	Not following Tata Power Procedure & Standard	4	2000/-
5.	Unsafe Act/Condition of Severity 4	4	2000/-
6.	Unsafe Act/Condition of Severity 5	5	5000/-
7.	No Earthling of Electrical equipment	5	5000/-
8.	Damaged welding cable	5	5000/
9.	Violation of Positive Isolation Procedure (LOTO Not followed)	5	5000/
10.	ELCB of more than 30 mA/ELCB not working	5	5000/
11.	On/Off switch of welding m/c not working	5	5000/
12.	Electric cable tied with metal wire	5	5000/
13.	Leakage found DA hose / cylinder	5	5000/
14.	Use of LPG	5	5000/
15.	Use of IC engine-based Three-wheeler at the work site.	5	5000/
16.	Starting the job without Toolbox Talk	5	5000/
17.	Spatter falling on DA hose / Gas-line/ pathways / Equipment	5	5000/
18.	No safety latch in crane hook	5	5000/
19.	Load raised or swung over people or occupied areas of buildings	5	5000/
20.	Persons standing in swing area of construction equipment.	5	5000/
21.	Using damaged slings.	5	5000/
22.	Unstable scaffolding/nonstandard Scaffolding in use	5	5000/
23.	Handrails and mid-rails are missing	5	5000/
24.	Safety Harness not anchored with lifeline/fixed structure	5	5000/
25.	Fall arrestor not provided/ Not being used.	5	5000/
26.	Double lifeline not used for working at height	5	5000/
27.	No rubber mat in Electrical Distribution (DB) room	4	2000/-
28.	Water found accumulated in Electrical Distribution room/near welding machine.	4	2000/
29.	Inserting electric cables into socket, without using plug.	4	2000/
30.	Use of damaged electrical cable/two core cables.	4	2000/
31.	Inflammable material found in Distribution Room / welding areas.	4	2000/
32.	Loose material falling into excavated pit	4	2000/
33.	Water logging into excavated pit /trenches	4	2000/
34.	No / inadequate Barricade	4	2000/
35.	Undercut / cave-in found on sides of excavated pits	4	2000/
36.	Grinding wheel/ Coupling/ Piling winch/other rotating parts without guard	4	2000/

37.	The HMV/Mobile Crane operator does not have a valid HMV driving license.	4	2000/
38.	The loading area is not leveled properly.	4	2000/
39.	Ladder not anchored at top	4	2000/
40.	Opening found in working platform of scaffolding/floor	4	2000/
41.	Inadequate illumination at the working area	4	2000/
42.	Loose material lying on Gantry, platform	4	2000/
43.	Cleaning with Compressed Air.	3	500/-
44.	Gas Cylinders using without cap.	3	500/
45.	Gas Cylinders stored without securing	3	500/
46.	Bringing inside any other chemicals, apart from approved by Safety dept.	3	500/
47.	Using drum for sitting or accessing height.	3	500/
48.	Misusing emergency facilities like fire hydrant line/ hose box/ spray system/ eye wash etc.	3	500/
49.	No provision of Safety net where falling materials or tools may occurs	3	500/
50.	Taking electrical supply from non-designated outlet (other than socket).	3	500/
51.	Restricted gangways due to unwanted materials.	3	500/
52.	Not reporting incident.	3	500/
53.	Entering into restricted area like switch yard/ hazardous storage	3	500/
54.	Work without supervision	3	500/
55.	Parking of vehicle without applying wheel choke at right front-front and left rear-rear wheels other than passenger cars.	3	500/
56.	Heavy Vehicle without helper or co-driver.	3	500/
57.	Not wearing florescent safety jacket at site.	3	500/
58.	People travelling in load body of vehicle.	3	500/
59.	Parking of vehicles at non designated area.	3	500/
60.	Shifting heavy materials without guide ropes.	3	500/
61.	Using other than 24V lamp inside the confined space/Use of other than 24V lamps.	3	500/
62.	Angular loading/ lifting with Crane or hoist.	3	500/
63.	By passing the limit switch/ Safety Interlock.	3	500/
64.	Housekeeping activities on road without proper barricade.	3	500/
65.	Trying to board or alit from running vehicle.	3	500/
66.	Cylinder Valves of Gas cylinders not closed when not in use.	3	500/
67.	Flash-back arrester not used.	3	500/
68.	Hand Trolley wheel found damaged.	3	500/
69.	Guy ropes of required length on both sides of object are not used during movement with load.	3	5/ 00/
70.	Scotch block/wedge not provided, when the vehicle is parked.	3	500/

71.	Suitable Trolley not provided to hold the cylinders.	3	500/
72.	Locked First Aid box	3	500/
73.	Caution boards, danger signs (luminescent /red) along with emergency contact number are not found displayed.	3	500/
74.	Person found jumping barricading tape	3	500/
75.	Stacking of pipes, pile casing, drums without chock blocks/wedges	3	500/
76.	The terrain on which Heavy Equipment/Machinery moves is not reasonably hard.	3	500/
77.	Without Safety Helmet at working sites	4	250/-
78.	Without Crash Helmet (on bikes)	4	500/-
79.	Without Full body double lanyard Safety Harness (for work at height)	5	5000/-
80.	Without Hand gloves - Material Handling, Welding, Cutting,	4	100/-
81.	Without Safety goggles/ face shield - Welding/Cutting /Grinding	5	5000/-
82.	Handling Chemical without PVC Apron	5	5000/-
83.	Smoking in prohibited area (e.g. Go down / Warehouse / Store of flammable material etc. / Area prone to dust explosion)	5	1000/-
84.	Sleeping at Workplace	3	100/-
85.	Driving beyond speed limit	3	1000/-
86.	Seat Belt While Driving (for front seat passengers and driver)	3	500/-
87.	Driving without license	4	1000/-
88.	Heavy Commercial vehicles without reverse horn	3	500/-
89.	Nonfunctional Head light/ taillight and side indicators	3	100/-
90.	Using Mobile Phone During Driving	5	5000/-
91.	Poor visibility of registration number/ without registration number	3	100/-
92.	Broken/ without Side view mirror	3	100/-
93.	Over speeding above specified limit	3	500/-
94.	Broken/ Without Pressure gauge on Oxygen/ LPG / Acetylene cylinder.	3	500/-
95.	Without Flash back arrestor on Industrial Acetylene & Oxygen cylinders.	5	5000/-
96.	Spillage of hazardous material/chemicals during transportation	4	2000/-
97.	Electrical equipment without Earthing/ ELCB/ Double Insulation Cable.	5	5000/-
98.	Lifting Tools & Tackles used without/ expired Test Certificates.	5	5000/-
99.	Housekeeping repeatedly not maintained		
100.	• First Time	3	Warning
101.	• Second Time	4	1000/-

102.	• Third Time	5	5000/-
103.	Serious Violation of House Keeping (after 1st or 2nd warning to be decided by Project Manager depending on the severity)	5	Rs.10000/- and above
104.	Repeat Violation of same nature	5	5 X Penalty for Violation
105.	Appointment of subcontractor without his Safety Bid Evaluation and/or without the permission of engineer in charge or Order manager.	5	5% of Contract Value

Safety Bid Document

Safety PQR Requirement

If the job is ''High Risk " or “High Value " or " Long duration” then Tata Power Corporate Contracts Department will attach following documents along with the Request for Quotation (RFQ):

1) Tata Power Safety Terms and Conditions (attached Separately)
2) Tata Power CSM- F7-Safety Competency Form
3) Tata Power CSM-F8-PPE Requirements

If the job is not coming under "High Risk /High value /Long duration” than the RFQ will be contain only "Tata Power Safety Terms and Conditions"

CSM-F7-Safety Competency Form

Name of the Vendor/Bidder :-

Name of the Sub Vendor **(If job is given to Sub Vendor)** **:-**

Description of the Job :-

Request for Quotation (RFQ) No. :-

Vendor/Bidder to mandatorily provide the below safety competency related information.

1. **Proposed Manpower Deployment Schedule** :-

Category of Manpower Deployed	Minimum Qualification & Experience	Proposed Numbers against each category month-wise			
		Month 1	Month 2	…	Month n
Project Manager					
Site-In-Charge (Site Manager)					
Shift-in-Charge					
Safety Officers					
Supervisors					
Technicians					
a……					
b……					
Highly Skilled Workmen					
a……					
b……					
Skilled Workmen					
Semi-Skilled Workmen					
Unskilled Workmen					
Total Manpower					

Instructions to Bidder to fill:

1. Bidder to provide the overall site manpower deployment schedule as above.
2. Bidder to indicate (through colour code mentioned below) their direct and sub-contracted employees

Direct bidder employee
Partly Direct / Partly sub-contracted
Sub-Contracted

3. Against each of the category, bidder to indicate the minimum qualification and experience of the proposed manpower.
4. Rows can be added to also identify other specialised manpower e.g. specific details to be included for high risk activities operators
5. Columns can be extended to the actual duration of Site activities.
6. Bidder to note that if operations is in shifts, then Shift-in-charge / safety officers are required for each shift of operation.

2. List of Tools ,Tackles & Equipments :-

Bidder/Vendor to provide the list of tools, tackles, equipments to be used during the job/ project execution. Bidder/Vendor to ensure that all the lifting tools and tackles, pressure vessels are duly certified by the competent person authorised by the Chief Inspector of Factories of the respective state prior to start of the job

Sr. No.	Description of Tools / Tackles	Capacity / Rating	Quantity	Make	Remarks
1					
2					
3					
4					
5					
6					
7					
...					

3. Safety Records:

Bidder to provide the details of fatalities and lost work day cases (LWDC) which may happened during the last three years (data to be provided for the last completed year and preceding 2 years).

Description	Safety Data for Last 3 Years		
	Year 1	Year 2	Year 3
	20__ - __	20__ - __	20__ - __
Fatalities (Nos.)			
Lost Work Day Cases (Nos.)			

In case of no fatalities, LWDC during any year, the form may be filled stating NIL against the respective year. Bidders are encouraged to also submit the RCA / incident investigation reports and the learning's implemented out of the above reported incidents

4. Job Safety Plan/ Method Statement:

Bidder to provide / enclose a detailed Site/Job Safety Plan along with a Method statement detailing the execution philosophy (how the bidder intends to execute the Job/Project), identifying all key activities which are required to be performed by the contractor at Site. Bidder to also list down all high risk activities and provide the Hazard Identification and Risk Assessment (HIRA) for all such high risk activities involved in the site work.

5. Accreditations:

Sr.	Certification	Yes / No	If Yes, Year of Certification	If No, Planned date for Certification
1.	ISO 9001			
2.	ISO 14001			
3.	OSHAS 18001			
4.	Any other (please specify…….)			
Note: Please attach certificates to support above. In case not accredited for above but applied for, application letters may be attached.				

CSM-F8-PPE Requirements

The Bidder/Vendor shall ensure that the following PPE of Approved standards shall be available at all time and shall be used by his employees with no exception whatsoever.

1	All contractor's employees at site	Safety Florescent Jacket (orange colour), Safety helmet & safety shoes with steel toe cap
2	Workers mixing asphalt , cement , lime / concrete	Safety goggle & protective Hand gloves and footwear, Nose mask.
3	Welders / Grinders	Welding screen/goggles , safety shoes, leather hand gloves, aprons , leg guard
4	Stone breaker	Protective goggle, hearing protection, anti vibration hand gloves and Protective clothing.
5	Electricians	Rubber hand gloves & Electrical resistant shoes.
6	Workers engaged in insulation using glass wool etc.	Respiratory mask & leather Hand gloves, goggles.
7	Workers engaged in coal handling plant, ash handling plant and working in high dust area.	Dust mask, Hand gloves, protective goggles.
8	Workers working at a height of 1.8 Meter or above.	Double lanyard full body harness, Fall arrestor and safety net made of reinforced nylon fiber ropes firmly supported with steel structures

• PPE shall be conforming to BIS/DGMS/DIN specifications, in good condition and shall be comfortable to his employees, when used.

HEALTH AND SAFETY POLICY

We, at Tata Power, reaffirm our belief that the health and safety of our stakeholders is of the utmost importance and takes precedence in all our business decisions. In pursuit of this belief and commitment, we strive to:

- Maintain and proactively improve our management systems to minimize health and safety hazards to our stakeholders and all others influenced by our activities.
- Comply and endeavour to exceed all applicable occupational health & safety legal and other requirements by setting the highest standards.
- Integrate health & safety procedures and best practices into every operational activity with assigned line-functional responsibilities at all levels, for improving and sustaining health & safety performance.
- Involve our employees in maintaining a safe and healthy work environment through risk assessments, periodic reviews of operational procedures, safe work methods and adoption of new technology.
- Develop a culture of safety through active leadership and provide appropriate training at all levels to enable employees developing their skills to work safely.
- Incorporate appropriate health & safety criteria into business decisions for selection of plant and technology, performance appraisal of individuals and appointments in key positions.
- Ensure availability at all times of appropriate resources to fully implement the health & safety policy of the company.
- Promptly report incidents, investigate for root causes and ensure lessons learnt shared and deployed across the company.
- Ensure service providers and their workmen align with company's safety codes and practices for the health and safety of personnel working with us.
- Set safety & health metrics as indicators of excellence, monitor progress and continually improve performance.

We shall actively communicate this policy to all stakeholders by suitable means and periodically review its relevance in continuously changing business environment.

(Praveer Sinha)
CEO & Managing Director

Date: 15th June, 2018

TATA POWER

Lighting up Lives!

CORPORATE ENVIRONMENT POLICY

Tata Power is committed to a clean, safe and healthy environment, and we shall operate our facilities in an environmentally sensitive and responsible manner. Our commitment to environmental protection and stewardship will be achieved by:

- Complying with the requirements and spirit of applicable environmental laws and striving to exceed required levels of compliance wherever feasible
- Ensuring that our employees are trained to acquire the necessary skills to meet environmental standards
- Conserving natural resources by improving efficiency and reducing wastage
- Making business decisions that aim towards sustainable development
- Engaging with stakeholders to create awareness on sustainability

Date: 15th June, 2018

(Praveer Sinha)
CEO & Managing Director

TATA POWER
Lighting up Lives!

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!

TATA CODE OF CONDUCT 2015

LEADERSHIP THAT INSPIRES

For over 100 years, the Tata group has been led by visionaries who have stayed true to the vision of the founder, Jamsetji Tata.
A vision that placed the greater good of society at par with business growth.
A vision that put into practice pioneering social initiatives that changed the way responsible business was run.
And a vision that brought into the group a strong social conscience.

We do not claim to be more unselfish, more generous or more philanthropic than other people. But we think we started on sound and straightforward business principles, considering the interests of the shareholders our own, and the health and welfare of the employees, the sure foundation of our success.

Jamsetji Tata
Founder of the Tata group
Chairman (1868 – 1904)

CONTENTS

FOREWORD

Tata companies have consistently adhered to the values and ideals articulated by the Founder for over 150 years. The Tata Code of Conduct was first formalized by Mr Ratan Tata. It articulates the Group's values and ideals that guide and govern the conduct of our companies as well as our colleagues in all matters relating to business. Today, the Code is a bedrock on which we base our individual, as well as leadership commitments to core Tata values.

The Tata Code of Conduct outlines our commitment to each of our stakeholders, including the communities in which we operate, and is our guiding light when we are sometimes faced with business dilemmas that leave us at ethical crossroads. The Code is also dynamic in that it has been periodically refreshed in order to remain contemporary and contextual to the changes in law and regulations. However it remains unaltered at its core.

Our stellar reputation and success as a business entity has been defined by the powerful commitment and adherence to the core values and principles expressed in this Code, by all our employees, directors and partners. I trust every Tata colleague and Tata company will continue to not only comply with the laws and regulations that govern our business interests around the world, but will continue to set new standards of ethical conduct that will generate deep respect and inspire emulation by others.

N. Chandrasekaran
21st February, 2017

A. OUR VALUES

TATA has always been values-driven. The five core values that underpin the way we conduct our business activities are:

INTEGRITY

We will be fair, honest, transparent and ethical in our conduct; everything we do must stand the test of public scrutiny.

UNITY

We will invest in our people and partners, enable continuous learning, and build caring and collaborative relationships based on trust and mutual respect.

RESPONSIBILITY

We will integrate environmental and social principles in our businesses, ensuring that what comes from the people goes back to the people many times over.

PIONEERING

We will be bold and agile, courageously taking on challenges, using deep customer insight to develop innovative solutions.

EXCELLENCE

We will be passionate about achieving the highest standards of quality, always promoting meritocracy.

These universal values serve as the foundation for the Tata Code of Conduct. They find expression within the value system of every Tata company.

B. SCOPE AND PURPOSE OF THIS CODE

1. This Code sets out how we behave with:
   - our employees, or those who work with us;
   - our customers;
   - the communities and the environment in which we operate;
   - our value-chain partners, including suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents;
   - our joint-venture partners or other business associates;
   - our financial stakeholders;
   - the governments of the countries in which we operate; and
   - our group companies.
2. In this Code, "we or us" means our company, our executive directors, officers, employees and those who work with us, as the context may require.
3. The term "our group companies" in this Code typically means companies Tata Sons intends for this Code to apply to, and / or to whom Tata Sons has issued this Code.
4. This Code sets out our expectations of all those who work with us. We also expect those who deal with us to be aware that this Code underpins everything we do, and in order to work with us they need to act in a manner consistent with it.

REMEMBER...

It is our commitment to protect our reputation and our brand equity by adhering to the values and principles set out in this Code. By doing so, we strengthen our unique culture and identity.

OUR CORE PRINCIPLES

The Tata philosophy of management has always been, and is today more than ever, that corporate enterprises must be managed not merely in the interests of their owners, but equally in those of their employees, of the consumers of their products, of the local community and finally of the country as a whole.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

C. OUR CORE PRINCIPLES

1. We are committed to operating our businesses conforming to the highest moral and ethical standards. We do not tolerate bribery or corruption in any form. This commitment underpins everything that we do.
2. We are committed to good corporate citizenship. We treat social development activities which benefit the communities in which we operate as an integral part of our business plan.
3. We seek to contribute to the economic development of the communities of the countries and regions we operate in, while respecting their culture, norms and heritage. We seek to avoid any project or activity that is detrimental to the wider interests of the communities in which we operate.
4. We shall not compromise safety in the pursuit of commercial advantage. We shall strive to provide a safe, healthy and clean working environment for our employees and all those who work with us.
5. When representing our company, we shall act with professionalism, honesty and integrity, and conform to the highest moral and ethical standards. In the countries we operate in, we shall exhibit culturally appropriate behaviour. Our conduct shall be fair and transparent and be perceived as fair and transparent by third parties.
6. We shall respect the human rights and dignity of all our stakeholders.
7. We shall strive to balance the interests of our stakeholders, treating each of them fairly and avoiding unfair discrimination of any kind.
8. The statements that we make to our stakeholders shall be truthful and made in good faith.
9. We shall not engage in any restrictive or unfair trade practices.
10. We shall provide avenues for our stakeholders to raise concerns or queries in good faith, or report instances of actual or perceived violations of our Code.
11. We shall strive to create an environment free from fear of retribution to deal with concerns that are raised or cases reported in good faith. No one shall be punished or made to suffer for raising concerns or making disclosures in good faith or in the public interest.
12. We expect the leaders of our businesses to demonstrate their commitment to the ethical standards set out in this Code through their own behaviour and by establishing appropriate processes within their companies.
13. We shall comply with the laws of the countries in which we operate and any other laws which apply to us. With regard to those provisions of the Code that are explicitly dealt with under an applicable law or employment terms, the law and those terms shall take precedence. In the event that the standards prescribed under any applicable law are lower than that of the Code, we shall conduct ourselves as per the provisions of the Code.

REMEMBER...

"Good faith" means having a reasonable belief that the information you have provided is truthful. It does not mean having 'all the evidence' about the potential violation or case reported.

OUR EMPLOYEES

Once you got the best people, the people who shared our values and ideals, we left them free to act on their own. We do not fetter them. We encourage them and give them opportunities for leadership.

J.R.D. Tata
Chairman, Tata Sons (1938 – 1991)

D. OUR EMPLOYEES

Equal opportunity employer

1. We provide equal opportunities to all our employees and to all eligible applicants for employment in our company. We do not unfairly discriminate on any ground, including race, caste, religion, colour, ancestry, marital status, gender, sexual orientation, age, nationality, ethnic origin, disability or any other category protected by applicable law.
2. When recruiting, developing and promoting our employees, our decisions will be based solely on performance, merit, competence and potential.
3. We shall have fair, transparent and clear employee policies which promote diversity and equality, in accordance with applicable law and other provisions of this Code. These policies shall provide for clear terms of employment, training, development and performance management.

Q&A

A job requirement entails extensive travel. One of the candidates has excellent relevant experience and qualifications. However, this candidate is a single parent. As a result, I feel such a situation would significantly hinder this candidate's ability to cope with the job requirement. What should I do?

In accordance with the Code, the decision to recruit an employee should be based upon merit. We cannot make a presumption that the candidate would not be able to meet the travel requirements of the job. All eligible candidates should be provided with equal opportunity to demonstrate or justify that they can cope with the travel requirements of the job. Being a single parent cannot be a ground to be discriminated against at any stage of recruitment or ongoing employment in our company.

REMEMBER...

We do not tolerate harassment in any form and therefore we expect every employee to discourage such misdemeanours in the workplace.

Dignity and respect

4. Our leaders shall be responsible for creating a conducive work environment built on tolerance, understanding, mutual cooperation and respect for individual privacy.
5. Everyone in our work environment must be treated with dignity and respect. We do not tolerate any form of harassment, whether sexual, physical, verbal or psychological.
6. We have clear and fair disciplinary procedures, which necessarily include an employee's right to be heard.
7. We respect our employees' right to privacy. We have no concern with their conduct outside our work environment, unless such conduct impairs their work performance, creates conflicts of interest or adversely affects our reputation or business interests.

Human rights

8. We do not employ children at our workplaces.
9. We do not use forced labour in any form. We do not confiscate personal documents of our employees, or force them to make any payment to us or to anyone else in order to secure employment with us, or to work with us.

Bribery and corruption

10. Our employees and those representing us, including agents and intermediaries, shall not, directly or indirectly, offer or receive any illegal or improper payments or comparable benefits that are intended or perceived to obtain undue favours for the conduct of our business.

REMEMBER...

Violation by even a single employee of any law relating to anti-bribery, anti-corruption, anti-competition, data privacy, etc. could result in severe financial penalties and cause irreparable reputational damage to the company.

Gifts and hospitality

11. Business gifts and hospitality are sometimes used in the normal course of business activity. However, if offers of gifts or hospitality (including entertainment or travel) are frequent or of substantial value, they may create the perception of, or an actual conflict of interest or an 'illicit payment'. Therefore, gifts and hospitality given or received should be modest in value and appropriate, and in compliance with our company's gifts and hospitality policy.

Freedom of association

12. We recognise that employees may be interested in joining associations or involving themselves in civic or public affairs in their personal capacities, provided such activities do not create an actual or potential conflict with the interests of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

REMEMBER...

As a general rule, we may accept gifts or hospitality from a business associate, only if such a gift:

- has modest value and does not create a perception (or an implied obligation) that the giver is entitled to preferential treatment of any kind;
- would not influence, or appear to influence, our ability to act in the best interest of our company;
- would not embarrass our company or the giver if disclosed publicly.

The following gifts are never appropriate and should never be given or accepted:

- gifts of cash or gold or other precious metals, gems or stones;
- gifts that are prohibited under applicable law;
- gifts in the nature of a bribe, payoff, kickback or facilitation payment*;
- gifts that are prohibited by the gift giver's or recipient's organisation; and
- gifts in the form of services or other non-cash benefits (e.g. a promise of employment).

(*'Facilitation' payment is a payment made to secure or speed up routine legal government actions, such as issuing permits or releasing goods held in customs.)

Working outside employment with us

13. Taking employment, accepting a position of responsibility or running a business outside employment with our company, in your own time, with or without remuneration, could interfere with your ability to work effectively at our company or create conflicts of interest. Any such activity must not be with any customer, supplier, distributor or competitor of our company. Our employees must notify and seek prior approval for any such activity as per the 'Conflicts of Interest' clause of this Code and in accordance with applicable company policies and law.

Integrity of information and assets

14. Our employees shall not make any wilful omissions or material misrepresentation that would compromise the integrity of our records, internal or external communications and reports, including the financial statements.

15. Our employees and directors shall seek proper authorisation prior to disclosing company or business-related information, and such disclosures shall be made in accordance with our company's media and communication policy. This includes disclosures through any forum or media, including through social media.

16. Our employees shall ensure the integrity of personal data or information provided by them to our company. We shall safeguard the privacy of all such data or information given to us in accordance with applicable company policies or law.

17. Our employees shall respect and protect all confidential information and intellectual property of our company.

18. Our employees shall safeguard the confidentiality of all third party intellectual property and data. Our employees shall not misuse such intellectual property and data that comes into their possession and shall not share it with anyone, except in accordance with applicable company policies or law.

19. Our employees shall promptly report the loss, theft or destruction of any confidential information or intellectual property and data of our company or that of any third party.

Q&A

I am an accountant in the finance department of my company. Due to my artistic skills, I received an offer to pen cartoons for a children's publication for which I would receive compensation. I plan to undertake this activity during week-ends. What should I do before accepting this offer?

Before accepting the offer, you should ascertain whether the company policies and rules require you to make a disclosure to your supervisor so that the company may determine whether your undertaking this activity adversely affects our company's interests. On confirmation from the company that it does not do so, you would be free to take up the activity. It is also your duty to bring to the attention of the company whenever there is any change in the situation you have disclosed.

20. Our employees shall use all company assets, tangible and intangible, including computer and communication equipment, for the purpose for which they are provided and in order to conduct our business. Such assets shall not be misused. We shall establish processes to minimise the risk of fraud, and misappropriation or misuse of our assets.

21. We shall comply with all applicable anti-money laundering, anti-fraud and anti-corruption laws and we shall establish processes to check for and prevent any breaches of such laws.

Insider trading

22. Our employees must not indulge in any form of insider trading nor assist others, including immediate family, friends or business associates, to derive any benefit from access to and possession of price sensitive information that is not in the public domain. Such information would include information about our company, our group companies, our clients and our suppliers.

Q&A

Our company has recently announced the launch of a new business initiative. In connection with this, your friend who is a journalist with a leading business newspaper has asked you to provide some information that he could cover in his forthcoming article. He has promised not to quote you, or reveal your identity. Should you be giving him this information?

No. You should not be sharing information of this nature with the media, even if it is assured that the source would remain anonymous. Only authorised personnel in the company are permitted to speak to the media and provide information of this nature.

Our company has a "Use of Social Media" policy that lays down the "dos and don'ts" for use of social media even if you may access such media on your own time. Why is there such a policy?

External communication is a serious matter. It must be carefully managed because information put out with reference to our company or its businesses needs to be clear, truthful and not violate any undertakings we have given to other parties. In each business there are managers nominated to authorise and make different types of statements to the outside world. These managers should be consulted about any request for information you may receive or information you think we should give out.
In using social media, in particular blogs or social networking sites, you should exercise great caution while talking about our company or the business we do. It may feel like you are chatting with friends or expressing a personal opinion but even while doing so you cannot share any confidential information of our company.

REMEMBER...

We must respect the property rights of others by never misusing their assets, intellectual property or trade secrets, including the copying or downloading of unauthorised software, trademarks, copyrighted material or logos. We should never make unauthorised copies of computer software programs or use unlicensed personal software on company computers.

Prohibited drugs and substances

23. Use of prohibited drugs and substances creates genuine safety and other risks at our workplaces. We do not tolerate prohibited drugs and substances from being possessed, consumed or distributed at our workplaces, or in the course of company duties.

Conflicts of interest

24. Our employees and executive directors shall always act in the interest of our company and ensure that any business or personal association *including close personal relationships* which they may have, does not create a conflict of interest with their roles and duties in our company or the operations of our company. Further, our employees and executive directors shall not engage in any business, relationship or activity, which might conflict with the interest of our company or our group companies.

25. Should any actual or potential conflicts of interest arise, the concerned person must immediately report such conflicts and seek approvals as required by applicable law and company policy. The competent authority shall revert to the employee within a reasonable time as defined in our company's policy, so as to enable the concerned employee to take necessary action as advised to resolve or avoid the conflict in an expeditious manner.

26. In the case of all employees other than executive directors, the Chief Executive Officer / Managing Director shall be the competent authority, who in turn shall report such cases to the Board of Directors on a quarterly basis. In case of the Chief Executive Officer / Managing Director and executive directors, the Board of Directors of our company shall be the competent authority.

Q&A

You are responsible for maintaining our company's customer database. One of your friends is starting a business venture and requests you to share a few particulars from this database for marketing purposes of his business. He assures you that he would keep the data as well as his source confidential. Should you do so?

No. You should respect the confidentiality of customer information and not share any part of the database with any person without due authorisation.

You have access to revenue numbers of different business units of our company. While having a conversation with you over evening drinks, your friend enquires about the financial performance of our company. You do not share detailed information with your friend, but share approximate revenue figures. Is this conduct of yours correct?

No, it is not. You are not permitted to share financial information of our company with others who do not need to know this information. Financial information should always be safeguarded and disclosed only on a need-to-know basis after obtaining requisite approvals. Sharing of any price sensitive information that is not generally available with the public could also lead to violation of applicable insider trading laws.

27. Notwithstanding such or any other instance of conflict of interest that exists due to historical reasons, adequate and full disclosure by interested employees shall be made to our company's management. At the time of appointment in our company, our employees and executive directors shall make full disclosure to the competent authority, of any interest leading to an actual or potential conflict that such persons or their immediate family (including parents, siblings, spouse, partner, children) or persons with whom they enjoy close personal relationships, may have in a family business or a company or firm that is a competitor, supplier, customer or distributor of, or has other business dealings with, our company.

REMEMBER...

A conflict of interest could be any known activity, transaction, relationship or service engaged in by an employee, his/her immediate family (including parents, siblings, spouse, partner, and children), relatives or a close personal relationship, which may cause concern (based upon an objective determination) that the employee could not or might not be able to fairly perform his/her duties to our company.

Examples of Potential Conflicts of Interest

A conflict of interest, actual or potential, arises where, directly or indirectly, an employee or executive director:

(a) engages in a business, activity or relationship with anyone who is party to a transaction with our company;

(b) is in a position to derive an improper benefit, personally or for any family member or for any person in a close personal relationship, by making or influencing decisions relating to any transaction;

(c) conducts business on behalf of our company or is in a position to influence a decision with regard to our company's business with a supplier or customer where a relative of, or a person in close personal relationship with, an employee or executive director is a principal officer or representative, resulting in a personal benefit or a benefit to the relative;

(d) is in a position to influence decisions with regard to award of benefits such as increase in salary or other remuneration, posting, promotion or recruitment of a relative or a person in close personal relationship employed in our company or any of our group companies;

(e) undertakes an activity by which the interest of our company or our group companies can be compromised or defeated; or

(f) does anything by which an independent judgement of our company's or our group companies' best interest cannot be exercised.

28. If there is a failure to make the required disclosure and our management becomes aware of an instance of conflict of interest that ought to have been disclosed by an employee or executive director, our management shall take a serious view of the matter and consider suitable disciplinary action as per the terms of employment. In all such matters, we shall follow clear and fair disciplinary procedures, respecting the employee's right to be heard.

Examples of activities normally approved (post-disclosure) as per applicable company policy

Acceptance of a position of responsibility (whether for remuneration or otherwise) in the following cases would typically be permitted, provided the time commitments these demand do not disturb or distract from the employee's primary duties and responsibilities in our company, and are promptly disclosed to the relevant competent authority:

(a) Directorships on the Boards of any of our group companies, joint ventures or associate companies.

(b) Memberships/positions of responsibility in educational/professional bodies, where such association will promote the interests of our company.

(c) Memberships or participation in government committees/bodies or organisations.

Q&A

You are in a relationship with a colleague who has been recently moved into your team and would now be reporting to you. What should you do?

Romantic or close personal relationships with another employee where a reporting relationship exists and one is responsible for evaluating the other's performance, is likely to create a conflict of interest. In such a situation, you would need to report the potential conflict to your supervisor.

Your company is submitting a proposal to a company in which you were previously employed. You have confidential information pertaining to your previous employer, which you believe will help your present employer in winning the contract. Should you share this information?

No. You should not share this information with your company since it relates to confidential information of a third party. Your company respects its employees' duty to protect confidential information that they may have relating to their previous employers.

You are the purchasing manager in the procurement department of your company. You receive an invitation from a supplier to attend a premier sporting event as her guest. This particular supplier is one of the vendors who has submitted a proposal for an open tender issued by your company. Should you accept the invitation?

No. You should not accept the invitation in this instance. Since you are in a key decision-making role for the tender, any unusual benefit that you receive could be perceived as an inducement that could compromise your objectivity.

OUR CUSTOMERS

We have continued to enjoy prosperity, even with adverse times to fight against. Our relations with all concerned are the most friendly. We have maintained the same character for straight-forward dealing with our constituents and customers. Our productions have continued to be of the same high quality, and therefore command the best reputation and realise the highest prices. … I mention these facts only to point out that with honest and straight-forward business principles, close and careful attention to details, and the ability to take advantage of favourable opportunities and circumstances, there is a scope for success.

Jamsetji Tata
Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

E. OUR CUSTOMERS

Products and services

1. We are committed to supplying products and services of world-class quality that meet all applicable standards.
2. The products and services we offer shall comply with applicable laws, including product packaging, labelling and after-sales service obligations.
3. We shall market our products and services on their own merits and not make unfair or misleading statements about the products and services of our competitors.

Export controls and trade sanctions

4. We shall comply with all relevant export controls or trade sanctions in the course of our business.

Fair competition

5. We support the development and operation of competitive open markets and the liberalisation of trade and investment in each country and market in which we operate.
6. We shall not enter into any activity constituting anti-competitive behaviour such as abuse of market dominance, collusion, participation in cartels or inappropriate exchange of information with competitors.
7. We collect competitive information only in the normal course of business and obtain the same through legally permitted sources and means.

Dealings with customers

8. Our dealings with our customers shall be professional, fair and transparent.
9. We respect our customers' right to privacy in relation to their personal data. We shall safeguard our customers' personal data, in accordance with applicable law.

Q&A

You are the Regional Sales Manager of our company. You have become a member of an "informal group", on an instant messaging service, whose members are the regional sales heads of our company's competitors. The administrator of the group has requested an in-person meeting to informally discuss market conditions and brainstorm on "pricing strategy" from an industry perspective. What should you do?

Any meeting with competitors, especially to discuss "pricing strategy", could be an attempt to promote an anti-competitive practice or manipulate prices. You should respond by declining this invitation and exiting the "informal group". You should also report this incident to your supervisor and your Legal department.

You are attending a customer meeting with a colleague, and your colleague makes an untruthful statement about the company's services. What should you do?

You should assist your colleague in correcting the inaccuracy during the meeting if possible. If this is not possible, raise the issue with your colleague after the meeting to enable him/her or the company to correct any misrepresentation made to the customer.

While working on a customer project, you receive a call from your colleague. He used to manage that customer account before you took over his role. He recalls that he had worked with the customer on developing a new ordering system which he thinks would be beneficial for another customer and requests you to send him the project details. What should you do?

You must not share this information without specific approval of the customer; you are not permitted to use a customer's assets, including software, for another customer or for any personal use.

REMEMBER...

Striving for excellence in the standards of our work and in the quality of our goods and services is a core Tata value. It is the unwavering practice of this value that builds and sustains customer trust in our brand.

OUR COMMUNITIES AND THE ENVIRONMENT

> In a free enterprise, the community is not just another shareholder in business but is in fact the very purpose of its existence.

Jamsetji Tata

Founder of the Tata group
Chairman, Tata Sons (1868 – 1904)

F. OUR COMMUNITIES AND THE ENVIRONMENT

Communities

1. We are committed to good corporate citizenship, and shall actively assist in the improvement of the quality of life of the people in the communities in which we operate.
2. We engage with the community and other stakeholders to minimise any adverse impact that our business operations may have on the local community and the environment.
3. We encourage our workforce to volunteer on projects that benefit the communities in which we operate, provided the principles of this Code, where applicable, and in particular the 'Conflicts of Interest' clause are followed.

The environment

4. In the production and sale of our products and services, we strive for environmental sustainability and comply with all applicable laws and regulations.
5. We seek to prevent the wasteful use of natural resources and are committed to improving the environment, particularly with regard to the emission of greenhouse gases, consumption of water and energy, and the management of waste and hazardous materials. We shall endeavour to offset the effect of climate change in our activities.

OUR VALUE-CHAIN PARTNERS

If we had done some of the things that some other groups have done, we would have been twice as big as we are today. But we didn't, and I would not have it any other way.

J.R.D. Tata

Chairman, Tata Sons (1938 – 1991)

(on the pace of expansion of the Tata group in the 1960s and 70s)

G. OUR VALUE-CHAIN PARTNERS

1. We shall select our suppliers and service providers fairly and transparently.
2. 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.
3. Our suppliers and service providers shall represent our company only with duly authorised 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.
4. 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.
5. We respect our obligations on the use of third party intellectual property and data.

Q&A

You head the procurement function in our company. You have tight budgetary constraints for a project that you are working on. In order to complete the project within the targeted costs, you intend to request your supplier to provide you an exceptional discount on this project order on the understanding that you would "make it up to him" in future orders. Would you be violating the Code?

Yes, you would. Inducement in any form, including future benefits to the supplier, could compromise your ability to act objectively and in the best interests of the company and therefore must be avoided.

REMEMBER...

Our value-chain partners would include our suppliers and service providers, distributors, sales representatives, contractors, channel partners, consultants, intermediaries and agents; joint-venture partners and other business associates.

OUR FINANCIAL STAKEHOLDERS

Ethical behaviour in business – in every sphere and with all constituents – has been the bedrock on which the Tata group has built, and operates, its enterprises. This has been an article of faith for the group ever since its inception, a fundamental element of our cherished heritage and the essence of our way of life.

Ratan Tata
Chairman, Tata Sons (1991 – 2012)

H. OUR FINANCIAL STAKEHOLDERS

1. We are committed to enhancing shareholder value and complying with laws and regulations that govern shareholder rights.
2. We shall inform our financial stakeholders about relevant aspects of our business in a fair, accurate and timely manner and shall disclose such information in accordance with applicable law and agreements.
3. We shall keep accurate records of our activities and shall adhere to disclosure standards in accordance with applicable law and industry standards.

GOVERNMENTS

Business, as I have seen it, places one great demand on you; it needs you to impose a framework of ethics, values, fairness and objectivity on yourself at all times. It is not easy to do this; you cannot impose it on yourself forcibly because it has to become an integral part of you.

Ratan Tata
Chairman, Tata Sons (1991 – 2012)

I. GOVERNMENTS

Political non-alignment

1. We shall act in accordance with the constitution and governance systems of the countries in which we operate. We do not seek to influence the outcome of public elections, nor to undermine or alter any system of government. We do not support any specific political party or candidate for political office. Our conduct must preclude any activity that could be interpreted as mutual dependence/favour with any political body or person, and we do not offer or give any company funds or property or other resources as donations to any specific political party, candidate or campaign.

   Any financial contributions considered by our Board of Directors in order to strengthen democratic forces through a clean electoral process shall be extended only through the Progressive Electoral Trust in India, or by a similar transparent, duly-authorised, non-discriminatory and non-discretionary vehicle outside India.

Government engagement

2. We engage with the government and regulators in a constructive manner in order to promote good governance. We conduct our interactions with them in a manner consistent with our Code.

3. We do not impede, obstruct or improperly influence the conclusions of, or affect the integrity or availability of data or documents for any government review or investigation.

OUR GROUP COMPANIES

I do not think anyone was on par with Jamsetji as an industrial visionary. But that is not the sole reason why I have been an admirer of Jamsetji. The major reason was his sense of values, sterling values, which he imparted to this group. If someone were to ask me, what holds the Tata companies together, more than anything else, I would say it is our shared ideals and values which we have inherited from Jamsetji Tata.

J.R.D. Tata
Chairman, Tata Sons (1938 – 1991)

J. OUR GROUP COMPANIES

1. We seek to cooperate with our group companies, including joint ventures, by sharing knowledge, physical resources, human and management resources and adopting leading governance policies and practices in accordance with applicable law including adherence to competition law, where relevant.
2. We shall strive to achieve amicable resolution of any dispute between us and any of our group companies, through an appropriate dispute resolution mechanism so that it does not adversely affect our business interests and stakeholder value.
3. We shall have processes in place to ensure that no third party or joint venture uses the TATA name/brand to further its interests without proper authorisation.
4. Our Board of Directors shall consider for adoption policies and guidelines periodically formulated by Tata Sons and circulated to group companies.

Q&A

You are in the process of selecting potential vendors for an IT project in our company. In the final shortlist of two companies, one is a new start-up with limited references and a lower price-quotation, while the other is a Tata company with thirty years of implementation experience and good references, but a marginally higher quote for the same job. With all other parameters of choice being nearly equal, which company should you select for the job?

While price is undoubtedly an important criterion for decision making, it is clearly not the only one to be evaluated. You may also need to consider good customer references, proven track record and shared value systems in order to decide on your IT partner.

You are in the process of selecting potential vendors for a project. One of the three finalists is a group company. In reviewing the final proposals, you rank the group company second out of the three proposals based on pricing and total cost of ownership, and select the first-ranked vendor. Is this the right decision?

Yes. You should select the vendor that, on its own merits, is the vendor that is most appropriate for your company's requirements. You should not select a group company only because of its affiliation.

RAISING CONCERNS

We encourage our employees, customers, suppliers and other stakeholders to raise concerns or make disclosures when they become aware of any actual or potential violation of our Code, policies or law. We also encourage reporting of any event (actual or potential) of misconduct that is not reflective of our values and principles.

Avenues available for raising concerns or queries or reporting cases could include:

- immediate line manager or the Human Resources department of our company
- designated ethics officials of our company
- the 'confidential reporting' third party ethics helpline (if available)
- any other reporting channel set out in our company's 'Whistleblower' policy.

We do not tolerate any form of retaliation against anyone reporting legitimate concerns. Anyone involved in targeting such a person will be subject to disciplinary action.

If you suspect that you or someone you know has been subjected to retaliation for raising a concern or for reporting a case, we encourage you to promptly contact your line manager, the company's Ethics Counsellor, the Human Resources department, the MD/CEO or the office of the group's Chief Ethics Officer.

My supervisor has asked me to do something which I believe may be illegal. I am afraid if I do not do what I am told, I could lose my job. Should I do it?

No. Breaking the law is never an option. Discuss the situation with your supervisor to be certain that you both understand the facts. If your concerns are not resolved, contact a higher level supervisor, the Ethics Counsellor, the Legal department or report them via the company's confidential reporting system, if available.

I feel that my supervisor is treating me unfairly for reporting a concern to the Ethics Counsellor. What should I do?

Retaliation against anyone who raises a concern is a violation of the Code. You should therefore promptly report this action of your supervisor to the Ethics Counsellor or the MD/CEO of your company or via the company's confidential reporting system, if available.

ACCOUNTABILITY

This Code is more than a set of prescriptive guidelines issued solely for the purpose of formal compliance. It represents our collective commitment to our value system and to our core principles.

Every person employed by us, directly or indirectly, should expect to be held accountable for his/her behaviour. Should such behaviour violate this Code, they may be subject to action according to their employment terms and relevant company policies.

When followed in letter and in spirit, this Code is *'lived'* by our employees as well as those who work with us. It represents our shared responsibility to all our stakeholders, and our mutual commitment to each other.

SPEAK UP...

If you are unsure whether a particular action you are about to take is consistent with the principles set forth in the Code, ask yourself:

- Could it directly or indirectly endanger someone or cause them injury?
- Is it illegal/unlawful or out of line with our policies and procedures?
- Does my conscience reject it? Does it conflict with my personal values?
- Would I feel uncomfortable if the story appeared in the media? Would it shame my company, spouse, partner, parent or child?
- Does it 'feel' wrong?

If the answer to any of these questions is "Yes", please stop and consult your reporting manager, the Ethics Counsellor, the Human Resource department, the Legal department or any member of the senior management team, to assist you in making the decision.

When faced with a dilemma: Stop, Think, Act Responsibly

NOTE

The Code does not provide a comprehensive and complete explanation of all expectations from a company standpoint or obligations from a stakeholder standpoint.

Our employees have a continuing obligation to familiarise themselves with all applicable law, group-level advisories and policies, company-level policies, procedures and work rules as relevant. For any guidance on interpretation of the Code, we may seek support from our company's Ethics Counsellor or from the group's Chief Ethics Officer, as appropriate.

All joint ventures are encouraged to adopt the Tata Code of Conduct (TCOC) or a code of conduct that incorporates all elements of the TCOC.

This version of the Tata Code of Conduct supersedes all earlier versions and associated documents and stands effective from 29th July, 2015.

For any query or clarification on the Code, please contact the office of the group's Chief Ethics Officer via email at: ethicsoffice@tata.com.

TATA CODE OF CONDUCT – 2015

I acknowledge that I have received the Tata Code of Conduct.

I have read the Tata Code of Conduct and I acknowledge that as a Tata employee, I am required to comply with the guidelines described therein and failure to do so may subject me to action as per my employment terms and relevant company policies.

If I have a concern about a violation, or a potential violation of the Tata Code of Conduct, I understand that there are channels available to me in my company to report such concerns. By making use of these channels when necessary, I will play my part in maintaining the high ethical standards to which we hold ourselves.

Signature: _____

Date: _____

Name: _____

Department: _____

Address: _____

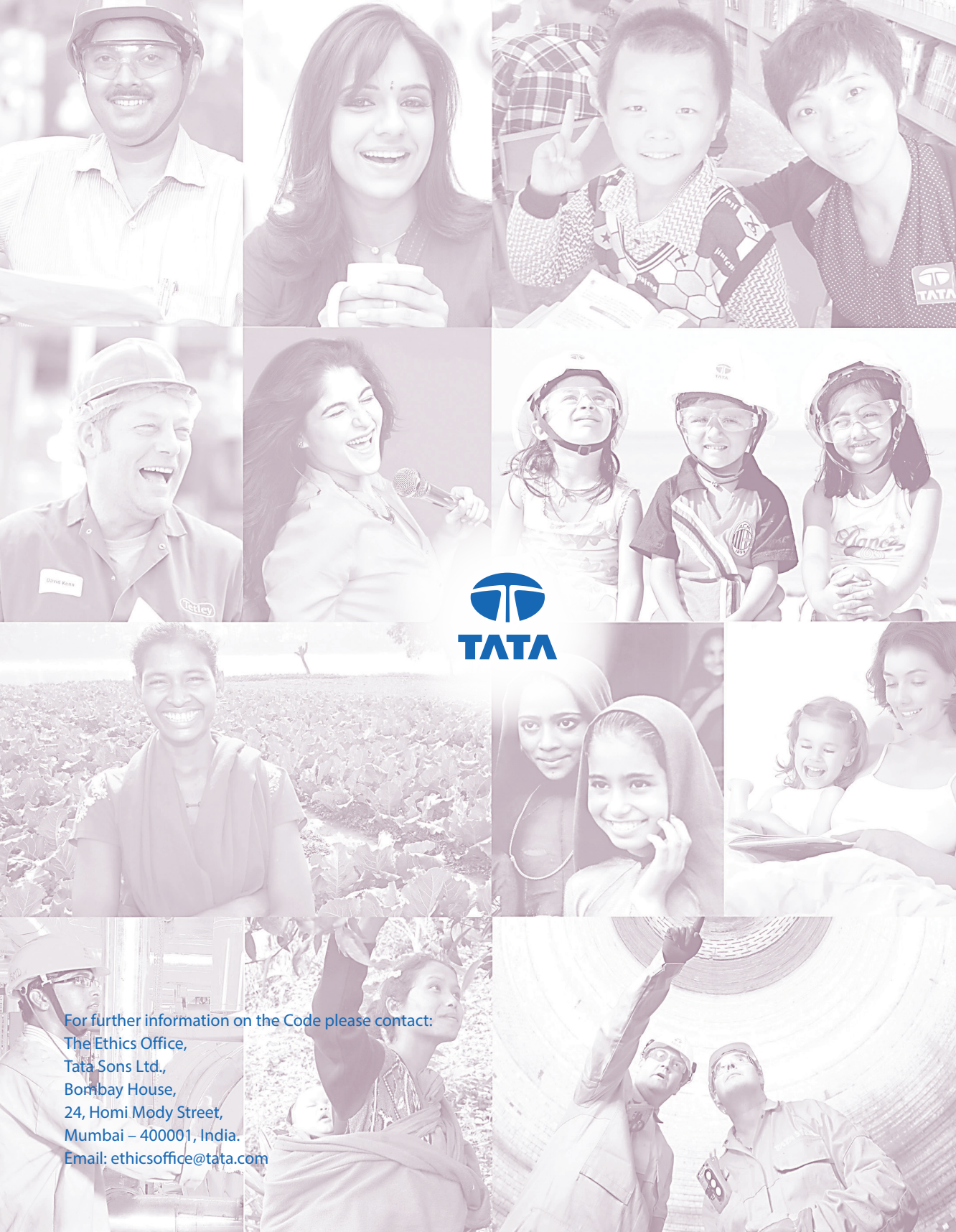
_____

_____

(Please submit this declaration to your Ethics Counsellor or the Human Resource department of your company.)

NOTES

NOTES



TATA

For further information on the Code please contact:
The Ethics Office,
Tata Sons Ltd.,
Bombay House,
24, Homi Mody Street,
Mumbai – 400001, India.
Email: ethicsoffice@tata.com

Annexure IX

BG Format (EMD BG, PBG/ CPBG)

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 .