ASSAM ELECTRICITY GRID CORPORATION LIMITED

Regd. Office: 1st Floor, Bijulee Bhawan, Paltan Bazar, Guwahati – 781001
CIN: U40101AS2003SGC007238
Ph:- 0361-2739520/Fax:-0361-2739513 Web: www.aegcl.co.in

BID IDENTIFICATION NO: AEGCL/DGM/LAC/TT/TLS-69/2022/597 ; Dated:07-04-2022

Bidding Document
For

Supply of Control and Relay Panel for integration to existing system along with Energy meter and all the accessories and mandatory spares related to CRP for construction of 33kV feeder bay at Barpeta Cancer Hospital at 132/33kV Barpeta GSS.

**DEPUTY GENERAL MANAGER,
LOWER ASSAM T&T CIRCLE, AEGCL
NARENGI, GUWAHATI-26.**

Bidder Signature &Seal

SECTION – 1
INSTRUCTION TO BIDDER

1.1.0   SCOPE OF BID :-

1.1.1.   The **Deputy General Manager, Lower Assam, T&T Circle, AEGCL** on behalf of **Assam Electricity Grid Corporation Ltd,** hereinafter referred to as AEGCL or Purchaser invites sealed tenders in prescribed form, from reputed firms/ contractors/ manufacturers with sound technical and financial capabilities for the following work. A single stage two envelope procedure (**Techno-Commercial and Price Bid**) will be adopted for this tender.

a)   **NAME OF WORK** :- Supply of Control and Relay Panel for integration to existing system along with Energy meter and all the accessories and mandatory spares related to CRP for construction of 33kV feeder bay at Barpeta Cancer Hospital at 132/33kV Barpeta GSS.

b)   **ESTIMATED VALUE FOR THE WORK :- Rs. 19,28,415.00 (Rupees Nineteen Lakh Twenty Eight Thousand and Four Hundred and Fifteen)** only including taxes.

c)   **Fund: DEPOSIT WORK**

d)   **Key Dates: Refer to NIT.**

e)   **Bidding address** :-
O/o The Deputy General Manager
Lower Assam, T&T Circle, AEGCL,
Narengi.Guwahati-26

[e-mail: dgmttc.guwahati@aegcl.co.in]

f)   **Interested bidders may purchase the tender documents from the office of The Deputy General Manager, Lower Assam, T&T Circle, AEGCL, Narengi,Guwahati-26 during office hours.** Bidders may obtain further information from the office of the Deputy General Manager, Lower Assam T&T Circle, AEGCL, Narengi, Guwahati - 781026, Assam.

g)   **Cost of Bidding :-** The bidder shall bear all costs associated with the preparation and submission of its bid and AEGCL will in no case be responsible or liable for those costs. The cost of the tender paper is **Rs. 2000/- (Rupees Two Thousand) only** to be pledged in favour of "AEGCL, Guwahati" (in the form of A/C payee DD/Bankers Cheque).

1.2.0   BIDDING PROCEDURE :-

Two envelope bidding procedure will be adopted. Bidders are to submit two sealed envelopes simultaneously, one containing the technical & Commercial proposal, Part–I (Technical & Commercial Bid) and the other containing the price proposal Part-II (Price Bid), enclosed together in one sealed envelope. Initially, only the Part-I bids shall be opened. Part-I proposals submitted by bidders, which do not conform to the specified requirement, may be rejected as deficient bids. The Part-II (Price Bid) proposals of technically qualified bidders will be opened at a date and time, which will be informed to all the qualified bidders of Part-I.

1.3.0   SCOPE OF WORK :-

1.3.1   The brief description of the scope of work covered under this bidding document is furnished below:

a.   Design and supply of Control and Relay Panel and all the accessories and mandatory spares related to CRP for integration to existing SAS system.

b.   Design and supply works of SAMAST compliant Energy meter as specified including its installation.

c.   Loading at manufacturer's works, transportation and delivery at the substation site, including unloading at destination site.

d.   Freight & Transit Insurance, storage at site and site insurance of all materials at site shall be in the scope of the contractor.

e.   Arrangements of any permits required for transportation and movement of supplied materials. However, AEGCL shall assist as far as practicable in the process.

1.3.2   The Bill of Quantities for indicative purposes is furnished in Price Schedules.

1.3.3   The bidder on its own responsibility may visit and examine the Site of Works and its surroundings and obtain information that may be necessary for preparing the bid. Any permits or licenses that may be required to execute the works should also be obtained by the

contractor.

1.3.4 **The items mentioned in these Annexure shall only be used while quoting the bid prices. Any other items not specifically mentioned in the specification but which are required for installation, testing, commissioning and satisfactory operation of the cable as per Indian Standards/IE Rules/IE Act and concerned authority regulations are deemed to be included in the scope of the specification and no deviation in this regard shall be accepted.**

1.3.5 **No modifications/additions/ deletions shall be made by the bidder to the items and quantities given in these schedules.**

1.3.6 The successful bidder will be expected to complete the works within **3 months from the date of drawing approval.** Bidders should note that time is the essence of this bid.

1.4.0 **ELIGIBILITY CRITERIA OF THE BIDDER:**

1.4.1 A Bidder may be a private entity or a government-owned entity. However no Joint Venture Bid shall be allowed.

1.4.2 A Bidder shall have Indian nationality. A Bidder shall be deemed to have the nationality of a country if the Bidder is a national or is constituted, incorporated, or registered and operates in conformity with the provisions of the laws of Republic Of India.

1.4.3 AEGCL considers a **conflict of interest** to be a situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations, and that such conflict of interest may contribute to or constitute a prohibited practice under Anticorruption Policy of Government of India and Government Of Assam. In pursuance Anticorruption Policy's requirement that Employer as well as bidders, suppliers, and contractors observe the highest standard of ethics. AEGCL will take appropriate actions if it determines that a conflict of interest has flawed the integrity of any procurement process.

1.4.4 A firm that is under a declaration of ineligibility by the AEGCL or any Government Entity or PSU at the date of the deadline for bid submission or thereafter i.e. on or before contract signing date shall be disqualified. Bidders shall provide such evidence of their continued eligibility satisfactory to the AEGCL, as the Employer shall reasonably request.

1.5.0 **FINANCIAL CAPABILITY**

1.5.1 Bidder will require to submit along with the bid the audited balance sheets and other legal financial statements acceptable to AEGCL, for the last 3 (three) years to demonstrate the current soundness of the Bidders financial position and its prospective long term profitability. As a minimum, an Applicant's net worth calculated as the difference between total assets and total liabilities should be positive. Wherever necessary the Employer may make enquiries with Bidder's bankers.

1.5.2 Average Annual Turnover : Minimum average annual turnover INR 5,78,524.00 calculated as total certified payments received for contracts in progress or completed, within the last 3 (Three) Years.

1.5.3 Financial Resources: Bidder need to demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet:
   (1)   the cash-flow requirement of atleast 70% of the work value and
   (2)   the overall cash flow requirements for this contract and its current works commitment.

1.5.4 Bidder must keep GST liabilities up to date and non-payment of GST liabilities and non-filing of relevant GST return more than 3 (three) months shall be reckoned as GST defaulter and this may be considered a cause for disqualification of a bidder and the bid may be rejected.

1.6.0 **EQUIPMENT CAPABILITIES**

1.6.1 The bidder should have assured access to supply of Control & relay panels and shall demonstrate that he or his supplier has capable of, manufacture & supply of such material. Bidders are required to demonstrate that based on known commitments the materials will be available for use in the proposed contract.

1.6.2 Bidder may be manufacturer of the offered products or a firm/company having authorisation from a manufacturer. In case the bidder is not a manufacturer of the offered products, bidder must submit manufacturer's authorisation using for that purpose Form-MA provided in Section-2 Bidding forms.

Bidder Signature &Seal

1.7.0 EXPERIENCE:

1.7.1 Experience on similar nature of works under contracts in the role of manufacturers, contractor, subcontractor, or management contractor for at least the last 5 (Five) years prior to the bid submission deadline.

1.7.2 Participation as manufacturer, contractor Experience having successfully completed similar works during last 5 years ending last day of the month previous to the one in which applications are invited should be either of the following:
(a) Three (3) similar completed works costing not less than 40% of the total estimated cost
(b) Two (2) similar completed works costing not less than 50% of the total estimated cost
(c) One (1) similar completed works costing not less than 80% of the total estimated cost

1.7.3 The Bidder must have experience of executing work of similar nature previously in AEGCL/APDCL. The bidder must submit experience and completion certificate for scrutiny by AEGCL. Each of such project/ works should consist of completion certificate.

1.8.0 LITIGATION HISTORY

Bidders shall submit details of all litigation, arbitration or other claims, whether pending, threatened or resolved in the last five years, with the exception of immaterial claims with a cumulative impact of not more than 10% of their total assets. The Employer may disqualify bidders in the event that the total amount of pending or threatened litigation or other claims represent more than 50% of their total assets.

1.9.0 DOCUMENTS COMPRISING THE BID

1.9.1 The bid submitted by the bidder shall comprise two envelopes submitted simultaneously, one containing only the technical proposal and the other the price proposal.

1.9.2 **The Technical Bid submitted by bidders shall contain the following:**

   a) Bid Submission Sheet

   b) Documentary evidence to establish that the Bidder meet the qualifying requirements in accordance with Clause 1.5.0.

   c) Documents to be furnished as per Clause 1.9.3`

   d) The Bid Guarantee (Bid Security) in accordance with Clause 1.20.0 & its sub clauses of this Section.

   e) All Bidding Schedules properly filled up including Price Bid Schedules.

   f) All other information and documents such as Guaranteed and Technical Particulars, type test reports, drawings, technical leaflets etc, as required in the Technical Specification

1.9.3 To establish its eligibility and qualifications to perform the contract, the bidder shall provide along with the above mentioned documents the following additional documents (mandatory) on qualifying requirements such as:

   a) *Copies of original documents defining the constitution or legal status, place of registration, and principal place of business, written power of attorney of the signatory of the Bid to commit the Bidder.*

   b) *Copies of valid Trade License and Electrical Licence issued by competent authority in the State of Assam or in the State where the bidder's business is registered.*

   c) *Copies of PAN, GST Registration Certificate as per Goods & Services Tax laws.*

   d) *Total monetary value of similar work performed by the bidder in each of the last three years.*

   e) *Experience in works of a similar nature and volume for each of the last three years, and details of works under way or contractually committed in AEGCL or any other Govt. entity/PSU who may be contacted for further information on those contracts.*

   f) *Qualifications and experience of key site management and technical personnel proposed for the Contract.*

   g) *Reports on the financial standing of the Bidder, such as profit and loss statements and audited annual accounts certified by CA of the company for the last three years including IT return duly acknowledged by the tax department for the last three years.*

   h) *Evidence of adequacy of working capital for this contract (access to line (s) of credit and availability of other financial resources).*

Bidder Signature &Seal

i) *Information regarding any litigation, current or during the last five years, in which the Bidder is involved, the parties concerned, and disputed amount.*

1.9.2 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:
Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements.

1.9.3 Notwithstanding anything stated herein above, AEGCL reserves the right to assess the capacity and capability of the bidder to execute the work, should the circumstance warrant such assessment in the overall interest of AEGCL.

1.10.0   DOCUMENTS ESTABLISHING CONFORMITY OF THE GOODS AND SERVICES

1.10.1 The documentary evidence of the conformity of the goods and services to the Bidding Document may be in the form of literature, drawings and data, and shall furnish:
a) A detailed description of the essential technical and performance characteristics of the goods and services, including the functional guarantees of the Goods, in response to the Specification;
b) A commentary on the Purchaser's Specification and adequate evidence demonstrating the substantial responsiveness of the plant and services to those specifications. Bidders shall note that standards for workmanship, materials and equipment designated by the Purchaser in the Bidding Document are intended to be descriptive (establishing standards of quality and performance) only and not restrictive. The Bidder may substitute alternative standards, brand names and/or catalog numbers in its bid, provided that it demonstrates to the Purchaser's satisfaction that the substitutions are substantially equivalent or superior to the standards designated in the Specification.

1.11.0   SITE VISIT
The interested bidders are advised to visit any grid substation of AEGCL and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid. The costs of visiting the Site shall be at the bidder's own expense.

1.12.0   CLARIFICATION ON BIDDING DOCUMENTS:-
1.12.1 A prospective bidder requiring any clarification of the bidding documents may notify AEGCL in writing at the following address-
Deputy General Manager, Lower Assam T&T Circle, AEGCL, Narengi, Guwahati-26

AEGCL will respond to any request for clarification which it receives earlier than 7 **(seven)** days prior to the deadline for submission of bids.

1.12.2 Verbal clarification and information given by AEGCL or its employee(s) or representative (s) shall not in any way be binding on AEGCL.

1.13.0   AMENDMENT OF BIDDING DOCUMENTS

1.13.1 At any time prior to the deadline for submission of bids, the AEGCL may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issuing addenda.

1.13.2 Any addendum thus issued shall be part of the bidding documents pursuant to Sub-Clause, and shall be communicated in writing or by fax to all purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum by fax to AEGCL.

1.14.0   LANGUAGE OF BID

1.14.1 The bid, and all correspondence and documents related to the bid, exchanged between the bidder and AEGCL shall be written in the English language. Supporting documents and printed literature furnished by the bidder shall also be in English language.

1.15.0   BID FORM AND PRICE SCHEDULES

1.15.1 The Bidder shall complete the Bid Form and the appropriate Price Schedules furnished in the bidding documents in the manner and detail indicated therein.

1.16.0   BID PRICES

1.16.1 Bidders shall give a breakdown of the prices in the manner and detail called for in the **Schedules of Prices**.

Bidder Signature &Seal

1.16.2   In the Schedules, Bidders shall give the required details and a breakdown of their prices, including all taxes, duties, levies, and charges payable as of twenty eight (28) days prior to the deadline for submission of bids, as follows:

(a)   Plant and equipment (**Schedules of Prices**) shall be quoted on an EXW (ex-factory, ex-works, ex-warehouse or off-the-shelf, as applicable). All taxes and duties taxes as applicable and freight and insurance shall be indicated separately.

1.16.3   Price Adjustment: Prices quoted by the Bidder shall be FIRM during performance of the contract. Duties and Taxes shall be adjusted, except there is variation due to changes in legislation of the Country.

1.17.0   INSURANCE

The Bidder shall insure the Works/Materials (in transit and at the site) in accordance with the requirements of General Conditions of Contract. The Bidder shall provide details of the policies that he intends to take out as part of his Bid submission. **The bid price shall include all costs in pursuance of fulfilling insurance liabilities under the contract.**

1.18.0   BID VALIDITY

1.18.1   Bids shall remain valid for a period of **180 (One Eighty)** days after the date of opening of Technical Bids.

1.18.2   In exceptional circumstances, prior to expiry of the original bid validity period, AEGCL may request that the bidders extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing. A bidder may refuse the request without forfeiting its bid security. A bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of its bid security for the period of the extension, and in compliance with Clause 1.19.0 in all respects.

1.19.0   BID SECURITY (EARNEST MONEY)

1.19.1   The Bidder shall furnish, as part of its bid with the Technical Proposal, a bid security in the amount of **Rs. 38,500.00 (Rupees Thirty Eight Thousand Five Hundred) only.**

1.19.2   For participation in the bidding procedure, participants must compulsorily pay the Bid Security / Earnest Money Deposit in the form of DD/Fixed Deposit/bank Guarantee/Banker's Cheque in favour of AEGCL, Guwahati. The bid security shall remain valid for 30 days beyond the original validity period for the bid, and beyond any period of extension subsequently requested.

1.19.3   Any bid not accompanied by an acceptable bid security shall be rejected as non-responsive.

1.19.4   The bid securities of unsuccessful bidders will be returned as promptly as possible, against written request from the unsuccessful bidders.

1.19.5   The bid security of the successful bidder will be returned when the bidder has signed the Contract Agreement and furnished the required performance security.

1.19.6   The bid security may be forfeited
(a)   if the bidder withdraws its bid, except as provided in Sub-Clause 1.24.1;
(b)   if the bidder does not accept the correction of its bid price, pursuant to Sub-Clause 1.24. or
(c)   in the case of a successful bidder, if it fails within the specified time limit to
(i)   sign the Contract Agreement,
(ii)   furnish the required performance security.

1.19.7   No interest shall be payable by AEGCL on the above bid guarantee.

1.20.0   ALTERNATIVE PROPOSALS BY BIDDERS

1.20.1   Bidders shall submit offers, which comply with the Bidding Documents, including the basic AEGCL's Requirements as indicated in the bidding documents. Alternatives will not be considered. The attention of bidders is drawn to the provisions of Clause 1.29.0 regarding the rejection of bids which are not substantially responsive to the requirements of the bidding documents.

1.21.0   FORMAT AND SIGNING OF BID

1.21.1   The bidder shall prepare one original and two copies of the bid proposal, clearly marking each one as: "ORIGINAL- BID PROPOSAL, etc as appropriate. In the event of discrepancy between the original and any copy, the original shall prevail.

1.21.2 The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder. All pages of the bid where entries or amendments have been made shall be initialed by the person or persons signing the bid.

1.21.3 The bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by AEGCL, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

1.21.4 The Bidders must submit the Bid Guarantee in separate sealed envelope, super-scribed as under:

"BID GUARANTEE (Name of the Package)"

1.21.5 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.

1.21.6 Bids by Corporation / Company must be signed with the legal name of the Corporation/Company by the President, Managing Director or by the Secretary or other person or persons authorized to Bid on behalf of such Corporation/Company in the matter.

1.21.7 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.

1.21.8 Satisfactory evidence of authority of the person signing on behalf of the Bidder shall be furnished with the Bid.

1.21.9 The Bidder's name stated on the proposal shall be exact legal name of the firm

1.21.10 Bids not conforming to the above requirements of signing may be disqualified.

1.21.11 If the outer envelope is not sealed and not marked as above, AEGCL will assume no responsibility for the misplacement or premature opening of the bid.

1.21.12 The Bid must be accompanied with requisite BID SECURITY in a separate sealed cover.

1.21.13 The Bidders have the option of sending the Bids by post/courier or in person. Bids submitted by Telex/ Telegram/Fax will not be accepted. No request from any Bidder to AEGCL to collect the proposal from Airlines/Cargo Agents etc shall be entertained by AEGCL.

1.22.0   DEADLINE FOR SUBMISSION OF BIDS

1.22.1 Bids must be received by AEGCL at the address specified above no later than refer to NIT.

1.22.2 AEGCL may, at its discretion, extend the deadline for submission of bids by issuing an addendum in accordance with Clause 1.13.0, in which case all rights and obligations of AEGCL and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

1.23.0   LATE BIDS

1.23.1 Any bid received by AEGCL after the deadline for submission of bids prescribed in Clause 1.22.0 will be rejected and returned unopened to the bidder.

1.24.0   WITHDRAWAL OF BIDS

1.24.1 The bidder may withdraw its bid after bid submission, provided that written notice of the withdrawal is received by AEGCL prior to the deadline for submission of bids.

1.24.2 The bidder's withdrawal notice shall be prepared, sealed, marked and delivered with the envelopes additionally marked "WITHDRAWAL".

1.24.3 Withdrawal of a bid during the interval between the deadline for submission of bids and the expiration of the period of bid validity specified in Sub-Clause 1.18.0 may result in the forfeiture of the bid security pursuant to Sub-Clause 1.19.6.

1.25.0   OPENING OF BIDS

1.25.1 AEGCL will open the Technical Bids (Part-I) , in the presence of bidders' representatives who choose to attend; at the following location:
        Deputy General Manager.
        LA T&T Circle, AEGCL, Narengi
        Guwahati-26

The bidders' representatives who are present shall sign a register evidencing their attendance.

1.25.2 Envelopes marked "WITHDRAWAL" shall be opened and read out first. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Claus 1.24.0 Oshall not be opened.

1.25.3 The bidders' names, the Bid Prices, the presence or absence of Bid Security, and such other details as AEGCL may consider appropriate, will be announced and recorded by AEGCL at the opening. The bidders' representatives will be required to sign this record.

1.26.0   PROCESS TO BE CONFIDENTIAL

1.26.1 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 AEGCL's processing of bids or award decisions may result in the rejection of the bidder's bid.

1.27.0   PRELIMINARY EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS

1.27.1 Prior to the detailed evaluation of bids, AEGCL will examine the bids to determine whether they are complete and all documents as per Clause 1.9.0 are provided or not, whether the documents have been properly signed, whether the required security is included, and whether the bids are generally in order and provides any clarifications and/or substantiation that AEGCL may require pursuant to Clause 1.27.0.

1.27.2 A substantially responsive bid is one which conforms to all the terms, conditions and requirements of the bidding documents, without material deviation or reservation and includes the amendments and changes, if any. AEGCL may waive any minor non-conformity or irregularity in a Bid which does not constitute a material deviation or reservation, provided such deviation or reservation does not (i) affect in any substantial way the scope, quality or performance of the Works; (ii) limit in any substantial way, inconsistent with the bidding document, AEGCL's rights or bidder's obligations under the contract; or (iii) whose rectification would affect unfairly the competitive position of other bidder's presenting substantially responsive bids.

1.27.3 Any bids found to be non-responsive for any reason or not meeting the minimum levels of the performance or other criteria specified in the bidding documents will be rejected by AEGCL and not included for further consideration.

1.28.0   CLARIFICATION OF BID PROPOSALS AND CONTACTING AEGCL

1.28.1 To assist in the examination, evaluation and comparison of Bids, AEGCL may, at its discretion, ask any bidder for clarification of its bid. The request for clarification and the response shall be in writing or by mail, but no change in the price or substance of the bid shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by AEGCL in the evaluation of the bids in accordance with Clause 1.28.0.

1.28.2 Subject to Sub-Clause 1.28.1, no bidder shall contact AEGCL on any matter relating to its bid from the time of opening Bids to the time the contract is awarded. If the bidder wishes to bring additional information to the notice of AEGCL, it should do so in writing.

1.28.3 Any effort by the bidder to influence AEGCL in AEGCL's evaluation of price proposals, bid comparison or contract award decisions may result in the rejection of the bidder's bid.

1.29.0   CORRECTION OF ERRORS

1.29.1 Price Proposals determined to be substantially responsive will be checked by AEGCL for any arithmetic errors. Arithmetic errors will be rectified on the following basis. If there is a discrepancy between the unit rate and the total cost that is obtained by multiplying the unit rate and quantity, the unit rate shall prevail and the total cost will be corrected unless in the opinion of AEGCL there is an obvious misplacement of the decimal point in the unit rate, in which case the total cost as quoted will govern and the unit rate corrected. If there is a discrepancy between the total bid amount and the sum of total costs, the sum of the total costs shall prevail and the total bid amount will be corrected.

1.29.2 The amount stated in the Form of Bid for Price Proposal will be adjusted by AEGCL in accordance with the above procedure for the correction of errors and, shall be considered as binding upon the bidder. If the bidder does not accept the corrected amount of bid, its bid will be rejected, and the bid security may be forfeited in accordance with Sub-Clause 1.19.6 (b).

1.30.0   EVALUATION AND COMPARISON OF BID PROPOSALS

1.30.1 AEGCL will evaluate and compare only the bids determined to be substantially responsive in accordance with Clause 1.27.0.

1.30.2   For equipments and materials, the comparison shall be of the ex-factory price of equipments and materials offered (such price to include all costs as well as duties and taxes paid or payable on components and raw material incorporated); plus the cost of transportation, local taxes and duties, civil works, installation and other services required under the contract with due corrections as per Clause 1.29.0, AEGCL's comparison will also include the costs if any, resulting from application of the evaluation procedures described in Sub-Clause 1.30.4.

1.30.3   AEGCL will carry out a detailed evaluation of the bids in order to determine whether the bidders are qualified and whether the technical aspects are substantially responsive to the requirements set forth in the bidding documents. In order to reach such a determination, AEGCL will examine the information supplied by the Bidders and other requirements in the bidding documents, taking into account the following factors:

(a)   Qualification

(i)   the determination will take into account the Bidder's financial and technical capabilities and past performance; it will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to Clause 1.5.0 as well as such other information as AEGCL deems necessary and appropriate; and

(ii)   an affirmative determination will be a prerequisite for AEGCL to continue with the evaluation of the proposal; a negative determination will result in rejection of the Bidder's bid.

(b)   Technical

(i)   overall completeness and compliance with AEGCL's Requirements; the technical merits of materials and equipments offered and deviations from AEGCL's Requirements; suitability of the facilities offered in relation to the environmental and climatic conditions prevailing at the site; quality, function and operation of any process control concept included in the bid;

(c)   Commercial

(i)   Deviations and omissions from the contractual and commercial conditions as identified in the Bid.

(ii)   compliance with the time schedule called for in the Bidding Document and evidenced as needed in a milestone schedule provided in the bid; and

(iii)   the functional guarantees of the facilities offered against the specified performance criteria of the plant and equipment.

1.30.4   Pursuant to Sub-Clause 1.30.4, the following evaluation methods will be followed:

(a)   **Time Schedule:** The plant and equipment covered by this bidding are required to be shipped, installed and the facilities completed within the period specified in Sub-Clause

Bidders submitting bids which deviate from the time schedule specified will be rejected.

(b)   **Deviations from the Bidding Document:**
Bidders shall base their Bid price on the terms & conditions specified in the Bidding Documents.

Bids with material deviations and omissions shall be rejected.

(c)   **Functional Guarantee of the facilities:**
Bidders shall state the functional guarantees (e.g. guaranteed performance or ratings or efficiency) of the proposed Goods in response to AEGCL's Requirements (Technical Specifications). Goods, Plant and equipment offered shall have a minimum performance (functional guarantees/ratings) specified in the Technical Specifications to be considered responsive. Bids offering Goods, plant and equipment with functional guarantees less than the minimum specified shall be rejected.

1.30.5   **Bid Evaluation Process for Abnormally Low Bids:**
The following methodology will be practiced for identification and treatment of the Abnormally Low Bids (ALB) in this tender process of AEGCL:

(a) Identification:
For the identification of the Abnormally Low Bids, two approaches as applicable shall be adopted:
i.   *Absolute Approach* when there is fewer than five substantially responsive bidders and if the bid price is 20% or more below AEGCL's cost estimate then AEGCL's tender evaluation committee should clarify the Bid price with the bidder to determine whether the Bid is abnormally low.

ii.   *Relative Approach* is a statical comparison method which will be applied when there are more than five nos. of substantially responsive bids. A potential ALB is identified where the low Bid is more than one standard deviation below the average of substantially responsive bids received.

In this approach first the Average bid price is determined and then by deducting the standard deviation from the average bid price, potentially ALB may be determined.

(b) In case of ALB, the tender evaluation committee of the respective tenders shall undertake the following three stage   review which are as follows:
  i.   Identify ALB as per the step mentioned in Clause No.(a).(i) and 10.b).(ii) whichever is applicable.
  ii.   Clarify and analyse the bidders resource inputs and pricing, including overheads, contingencies and profit margins. In that respect committee may seek the reference of the guidelines of World Bank, AIIB, ADB etc.
  iii. Decide whether to accept or reject the tender.

(c) Additional Performance Security in case of acceptance of ALB:
  i.   If any abnormally low bid is accepted under point no. (b) (iii), after taking of additional performance security as per   the assessment of the committee, however the total performance security should not have to exceed 20% of the total contract value.

  ii.   The additional performance security shall be treated as part of the original performance security and shall be valid for a period coextensive with the applicable defect liability period of the contract.

  iii. Non submission of the additional performance security shall constitute sufficient ground to rejection of the bid and similar assessment shall be initiated for the next ranked bidder identified as ALB.

1.30.6   AEGCL reserves the right to accept or reject any variation or deviation. Variations, deviations, and other factors which are in excess of the requirements of the bidding documents or otherwise result in the accrual of unsolicited benefits to AEGCL shall not be taken into account in bid evaluation.

1.31.0   AWARD

1.31.1   Subject to Clause 1.31.0, AEGCL will award the Contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents provided that such bidder has been determined to be qualified in accordance with the provisions of Clause 1.27.0.

1.32.0   EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

1.32.1   Notwithstanding Clause 1.31,0, AEGCL reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for AEGCL's action. AEGCL is not bound to accept the offer of the lowest bidder.

1.33.0   NOTIFICATION OF AWARD

1.33.1   Prior to expiration of the period of bid validity prescribed by AEGCL, AEGCL will notify the successful bidder by fax, confirmed by letter, that its bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") shall name the sum which AEGCL will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called "the Contract Price").

1.33.2   The notification of award will constitute the formation of the Contract.

1.34.0   SIGNING OF CONTRACT AGREEMENT

1.34.1   At the same time that it notifies the successful bidder that its bid has been accepted, AEGCL will send the bidder the Form of Contract Agreement incorporating all agreements between the parties.

1.34.2   Within **15 (fifteen) days** of receipt of the Form of Agreement, the successful bidder shall sign the Form and return it to AEGCL.

1.35.0   PERFORMANCE SECURITY

1.35.1   Within **15 (fifteen) days** of receipt of the notification of award from AEGCL, the successful bidder shall furnish to AEGCL a performance security in an amount of 10 (ten) percent of the Contract Price in accordance with the Conditions of Contract. The form

of performance security provided in **Section 5** of the bidding documents may be used or some other form acceptable to AEGCL. The above performance security may be withdrawn on submission of performance security as per clause No 2.6.0

1.35.2   In case the bidder fails to submit the Performance Security in the form of Bank Guarantee, an amount equivalent to 10% of the Contract Price shall be retained as Security Deposits which shall be retained up to 90 (ninety) days after the end of Warranty Period.

1.36.0   CORRUPT OR FRAUDULENT PRACTICES

1.36.1   It is required that bidders/suppliers/contractors observe the highest standard of ethics during the procurement and execution of the contracts. In Pursuance of this Clause AEGCL;

(a)   defines, for the purposes of this provision, the terms set forth below as follows:

(i)   "corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

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

(b)   will reject a proposal for award if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(c)   will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract by AEGCL if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a contract.

Bidder Signature &Seal

SECTION-2

SPECIAL CONDITIONS OF CONTRACT.

2.1.0   INTRODUCTION

2.1.1.   This Special Conditions of Contract is supplementary to AEGCL's "**General Conditions of Supply and Erection of AEGCL 2009**". *However, in case of any contradiction, stipulations made in this Bidding Document, it shall prevail.*

2.2.0   CONTRACTOR TO INFORM HIMSELF FULLY

2.2.1.   The contractor should admit that he has examined the general condition of contract, specifications and schedule and has satisfied as to all the conditions and circumstances affecting the contract prices and fixed his price according to his own views on these matters and acknowledge that no additional allowances except as otherwise provided therein will be levied. The purchaser shall not be responsible for any misunderstanding or incorrect information obtained by the contractor other than information given to the contractor in writing by the purchaser.

2.3.0   EXTENSION OF TIME

2.3.1.   If the completion of the work is delayed due to reason beyond the control of the contractor, the contractor should without delay give notice to AEGCL within 7 (seven) days in writing of his claim for an extension of time. The AEGCL may extend the completion date as may be reasonable but without prejudice to other terms and conditions of the contract.

2.4.0   VARIATIONS, ADDITIONS AND OMISSIONS

2.4.1.   The contractor shall not modify any of the terms and conditions except as directed in writing by AEGCL.

2.4.2.   The AEGCL shall have the right during the contract to amend, alter, omit or otherwise vary any of the items by notice in writings. The contractor shall carry out such variations although the said variations shall not exceed 15% of the contract price except with written consent of the purchaser. The amount of such variations shall be determined in accordance with rates specified in the contract and where such rates are not available this will be mutually agreed between the purchaser and the contractor.

2.5.0   PRICE BASIS:- Prices are to be FIRM. Supply rate should include prevailing rate of GST and freight and insurance charges. Whereas erection rate should include prevailing rate of works contract tax, service charges. Break up of taxes item wise should be shown separately. Prevailing rate of all taxes & duties should be mentioned. Road permit for supply items shall be arranged by the Contractor.

2.6.0   PERFORMANCE SECURITY (Contract Performance Guarantee)

2.6.1.   As a Contract Performance Security, the successful Bidder, to whom the work is awarded, shall be required to furnish a Performance Guarantee from a Nationalized Bank, in the form attached with the Bidding Document (Section –5) in favour of the AEGCL. The guarantee amount shall be equal to ten percent (10%) of the Contract Price and it shall guarantee the faithful performance of the contract in accordance with the terms and conditions specified in these documents and specifications. The guarantee shall be valid up to 90 (ninety) days after the end of Warranty Period.

2.6.2.   In case the bidder fails to submit the Performance Security in the form of Bank Guarantee, an amount equivalent to 10% of the Contract Price shall be retained as Security Deposits which shall be retained up to 90 (ninety) days after the end of Warranty Period

2.6.3.   The performance guarantee shall cover additionally the following guarantees to the owner:

   a)   The successful Bidder guarantees the successful and satisfactory operation of the equipment furnished and erected under the contract, as per the specifications and documents.

   b)   The successful Bidder further guarantees that the equipment/material provided and installed by him shall be free from all defects in design, material and workmanship and shall upon written notice from the Owner fully remedy to be guaranteed.

2.6.4.   The Contract performance Guarantee will be returned to the Contractor without any interest at the end of warranty period and written request from the contractor.

2.7.0   TAKING OVER

2.7.1   When entire scope of works is completed by the Contractor and successfully commissioned in accordance with the Contract, the same shall be taken over by AEGCL and a Taking-Over Certificate for the Works shall be issued.

2.7.2   The date of issue of the 'Taking Over Certificate' by AEGCL or its representative shall be the date of taking over the works.

2.8.0   TERMS OF PAYMENT

The terms of payment for the supply work shall be as follows

   i. No advance payment shall be made in this contract.
   ii. No claim for interest shall be entertained by AEGCL
   iii. The price is firm and no price variation shall be applicable.
   iv. Final bill must contain the original site register.
   v. 80% payment with 100% GST shall be released against receipt of materials in full and good condition at site. Balance 20% of the total work value shall be released on completion of erection works.
   vi. The Bidder / Firm will have to be submitted the following Net Banking details.
      a) Banker's Name & Branch
      b) Account No
      c) Banker's address
      d) Banker's IFSC Code
      e) Banker's RTGS Code

2.9.0   WARRANTY

2.9.1   The contractor warrants that all goods are new, unused and of the most recent or current models, and that they incorporate all recent improvements in design and materials, unless provided otherwise in the Contract. The term period of warranty shall mean the period of 18 months from the date of the materials are received at site in good and acceptable condition. If during the period of warranty, any defect is found, the Contractor shall rectify all defects in design, materials and workmanship that may develop under normal use of the equipment upon written notice from the Purchaser who shall indicate in what respects the equipment is faulty. The rectification / free replacement must be carried out within a reasonable time period and at free of cost.

2.9.2   In the event of any emergency, where in the judgment of AEGCL, delay would cause serious loss or damages, repairs or adjustment may be made by the engineer or a third party chosen by the engineer without advance notice to the contractor and the cost of such work shall be paid by the contractor. In the event such action is taken by the engineer, the contractor will be notified promptly and he shall assist wherever possible in making necessary corrections. This shall not relieve the contractor of his liabilities under the terms and conditions of the contract.

2.9.3   If it becomes necessary for the contractor to replace or renew any defective portions of the works, the provision of this clause shall apply to portion of the works so replaced or renewed until the expiry of twelve (12) months from the date of such replacement or renewal.

2.9.4   The repaired or new parts will be furnished and erected free of cost by the contractor. If any repair is carried out on his behalf at the site, the contractor shall bear the cost of such repairs.

2.9.5   The acceptance of the equipment by the Employer shall in no way relieve the contractor of his obligation under this clause.

2.9.6   In the case of those defective parts, which are not repairable at site but are essential for the commercial operation of the equipment, the contractor and the engineer shall mutually agree to a programme of replacement or renewal, which will minimize interruption to the maximum extent in the operation of the equipment.

2.10.0   LIABILITY FOR ACCIDENTS AND DAMAGE

2.10.1   The contractor shall indemnify the company (AEGCL) against any loss , damage, and injury to any person or to any property and against any other liability or obligation and against all actions, suits, claims demands costs, charges and expenses arising in connection with such damage , injury, liability or obligation resulting from:-

   (a). the negligence of the contractor and his workers, agents, subcontractors; and/or
   (b). the lack of or inadequacy of safety devices on equipment supplied under this contract.

2.11.0   USE OF MATERIALS ARRANGED BY THE BOARD

2.11.1   If any materials supplied by AEGCL are found to be misused or wasted due to negligence by the contractor comes to the notice of the Board then the contractor shall be liable to pay compensation to the Board as may be decided by the Board.

2.12.0   PENALTY FOR DELAYED EXECUTION

2.12.1   In the event of delay in completing the work extending beyond the date of completion or beyond the extended date, if any, permitted by the Board, the contractor shall pay as agreed liquidated damage and not as a penalty a sum equal to 1% of the contract price under this contract for each week of delay or part thereof subject to a maximum of 10% of the contract price.

2.13.0   SETTLEMENT OF THE DISPUTE & ARBITRATION

2.13.1   Any dispute arising out of the contract will first be discussed and settled bilaterally between the Assam Electricity Grid Corporation Limited and firms/ contractors. In case, the dispute cannot be settled bilaterally, it will be referred to arbitration by an arbitrator to be appointed by the AEGCL, The contractor shall not stop the work during settlement of any arbitration case. All disputes arising out of the agreement so made shall be subjected to the jurisdiction of district court of Kamrup District.

2.14.0   FORCE MAJEURE

2.14.1   Force Majeure shall be considered as any circumstances beyond the reasonable control of the party claiming relief, including but not limited to strikes lockout, civil commotion, riot, insurrection, hostilities, war, fire, flood, earthquake, delay in delivery of equipment's or part thereof by AEGCL, would entitle contractor to extension of time.

2.15.0   PROGRESS REPORT

2.15.1   The contractor shall submit to AEGCL monthly progress report within the first week of every month giving the status of the contract work along with adequate number of photograph, indicating the various stages of execution of this contract.

2.16.0   ACCOMMODATION OF CONTRACTOR'S PERSONNEL

2.16.1   No quarter shall normally be provided by the Board for the accommodation of any of the contractor's employee in connection with the erection work, in exceptional cases, where accommodation is provided to the contractor at AEGCL's discretion, recoveries shall be made at such rates as may be fixed by the Board towards rent of the buildings and furniture and fittings if any therein as well as charges for electric supply, water supply and conservancy.

2.16.2   The contractor shall at his own expenses make adequate arrangements for housing, supply of drinking water and provision of latrines and urinals for his staff and labour and disposal of sewage.

2.17.0   AGE LIMIT OF LABOUR
2.17.1   The contractor shall not employ persons below the age of 18 years as labours for the erection work.

2.18.0   SAFETY & PRECAUTIONS
2.18.1   The contractor shall provide adequate safety devices like head protective gears, belt etc, to his labours while executing the erection work.

2.19.0   INSURANCE

2.19.1   The Contractor at his cost shall arrange, secure and maintain all insurance as may be pertinent to the Works and obligatory in terms of law to protect his interest and interests of the Employer / AEGCL against all perils detailed herein. The form and the limit of such insurance as defined herein together with the under-writer in each case shall be acceptable to the AEGCL. However, irrespective of such acceptance, the responsibility to maintain adequate insurance coverage at all time during the period of contract shall be of the contractor alone. The contractor's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations. The insurance covers to be taken by the contractor shall be in a joint name of the Employer and the Contractor. The Contractor shall, however, be authorized to deal directly with Insurance Company or companies and shall be responsible in regard to maintenance of all insurance covers.

2.19.2   Any loss or damage to the equipment and material (including equipment's & materials handed over to Contractor for execution of the Contract) during handling, transportation, storage, erection, putting into satisfactory operation and all activities to be performed

till the successful completion of commissioning of the equipment shall be to the account of Contractor. The Contractor shall be responsible for preference of all claims and make good the damages or loss by way of repairs and/or replacement of the equipment, damaged or lost. The contractor shall provide the Employer with copy of all insurance policies and documents taken out by him in pursuance of the contract. Such copies of documents shall be submitted to the Employer immediately after such insurance coverage. The Contractor shall also inform the Employer in writing at least sixty (60) days in advance regarding the expiry/cancellation and/or change in any of such documents and ensure revalidation, renewal, etc., as may be necessary well in time.

2.19.3   The perils required to be covered under the insurance shall include, but not be limited to fire and allied risks, miscellaneous accidents (erection risks) workman compensation risks, loss or damage in transit, theft, pilferage riot and strikes and malicious damages, civil commotion, weather condition, accidents of all kinds, etc. The scope of such insurance shall be adequate to cover the replacement/reinstatement cost of the equipment for all risks up to and including delivery of goods and other costs till the equipment is delivered at Site. The insurance policies to be taken should be on replacement value basis and/or incorporating escalation clause. Notwithstanding the extent of insurance cover and the amount of claim available from the underwriters, the contractor shall be liable to make good the full replacement/rectification value of all equipments/materials and to ensure their availability as per project requirements.

2.19.4   The insurance shall also cover the Contractor against all claims arising from injuries, disabilities, disease or death of members of public or damage to property of others, due to any act or omission on the part of the Contractor, his agents, his employees, his representatives and Sub-contractors or from riots, strikes and civil commotion.

2.19.5   All costs on account of insurance liabilities covered under the contract will be to Contractor's account and will be included in Contract Price. However, the owner may from time to time, during the pendency of the contract, asks the contractor in writing to limit the insurance coverage, risks and in such a case, the parties to the contract will agree for a mutual settlement, for reduction in Contract price to the extent of reduced premium amount. The Contractor, while arranging the insurance shall ensure to obtain all discounts on premium which may be available for higher volume or for reason of financing arrangement of the project.

Bidder Signature &Seal

SECTION-3

PURCHASER'S REQUIREMENTS

3.1.0 SCOPE OF WORK:

3.1.1 The brief description of the scope of work covered under this bidding document is furnished below: The work involves design, engineering, manufacture, assembly, inspection, testing at manufacturer's works before dispatch, packing, supply, including insurance during transit, delivery at site of various equipment and materials including substation steel structures as specified in subsequent Clauses and Sections.

3.1.2 It is not the intent to specify completely herein all details of design and construction of the equipment and accessories. However, the equipment and accessories shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in continuous operation up to the bidder's guarantees in a manner acceptable to the Purchaser. The Purchaser will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance therewith.

3.1.3 The major items of works included in the scope of this specification are listed below:-

a. Design, engineering, manufacture, assembly and testing at manufacturer's works before dispatch, packing, supply, including insurance during transit, delivery at site of reputed make Control and Relay Panel including all the accessories and mandatory spares for integration to existing SAS system.

b. Design, engineering, manufacture, assembly and testing at manufacturer's works before dispatch, packing, supply, including insurance during transit, delivery at site of ABT complaint Energy meter as specified including installation.

c. Loading at manufacturer's works, transportation and delivery at the substation site, including unloading at destination site.

d. Freight & Transit Insurance, storage at site and site insurance of all materials at site shall be in the scope of the contractor.

e. Arrangements of any permits required for transportation and movement of supplied materials. However, AEGCL shall assist as far as practicable in the process.

3.1.4 The various items of supply are described very briefly in the schedule of Bid Form, Prices & Other Schedules and annexure. The various items as defined in these schedules shall be read in conjunction with the corresponding section in the technical specifications including amendments and, additions if any.

3.2.0 SERVICE CONDITIONS

3.2.1 The plant and materials supplied shall be suitable for operation under the following climatic and other conditions:

1. Peak ambient day temperature in still air   : 45ºC

2. Minimum night temperatures   : 0ºC

3. Reference ambient day temperature   : 45ºC

4. Relative Humidity   a) Maximum   : 100 %

                         b) Minimum   : 10 %

5. Altitude   : Below 1000 M above MSL

6. Maximum wind pressure   : As per IS: 802 latest code.

7. Seismic Intensity   : ZONE-V as per IS 1893.

3.3.0 STANDARDS

3.3.1 The equipment covered under this bidding document shall, unless otherwise stated be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards and shall conform to the regulations of local statutory authorities. In case of any conflict between the standards and this specification, this specification shall govern.

3.3.2 Equipment conforming to other international or authoritative Standards which ensure equivalent or better performance than that specified under Clause 3.6.0 above shall also be accepted. In that case relevant extracts of the same shall be forwarded with the bid.

3.4.0   ENGINEERING DATA

3.4.1   The furnishing of engineering data by the Contractor shall be in. accordance with the Bidding Document. The review of these data by the Employer will cover only general conformance of the data to the specifications and not a thorough review of all dimensions, quantities and details of the materials, or items indicated or the accuracy of the information submitted. This review by the Employer shall not be considered by the Contractor,as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications.

3.4.2   All engineering data submitted by the Contractor after review by the Employer shall or part of the contract document.

3.5.0   DRAWINGS AND DOCUMENTS FOR APPROVAL

3.5.1.   All necessary drawings and documents required for completion of the project is to be submitted by the contractor for approval. The drawings provided with bid (if any) are for indicative purpose only and fresh drawings are to be prepared by the contractor as per actual site condition after survey. The drawings and documents are to be approved by AEGCL before procurement or commencement of work.

3.5.2   All drawings submitted by the Contractor including those submitted at the time of Bid shall be with sufficient detail to indicate the type, size, arrangement, dimensions, material description, Bill of Materials, weight of each component break-up for packing and shipment, fixing arrangement required, the dimensions required for installation and any other information specifically requested in these specifications.

3.5.3   Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, the specification title, the specification number and the name of the Project. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be to the scale and in S.I. units.

3.5.4   **The drawings submitted for approval to the Employer shall be in quadruplicate**. One print of such drawings shall be returned to the Contractor by the Employer marked "approved/approved with corrections". The contractor shall there upon furnish the Employer additional prints as may be required along with one reproducible in original of the drawings after incorporating all corrections.

3.5.5   The Contractor shall perform the work strictly in accordance with these drawings and no deviation shall be permitted without the written approval of the Employer, if so required.

3.5.6   All manufacturing, fabrication and erection work under the scope of Contractor prior to the approval of the drawings shall be at the Contractor's risk. The contractor may make any changes in the design which are necessary to conform to the provisions and intent of the contractor and such changes will again be subject   to approval by the Employer.

3.5.7   The approval of the documents and drawings by the Employer shall mean that the Employer is satisfied that:

 a) The Contractor has completed the part of the Works covered by the subject document (i.e. confirmation of progress of work).

 b) The Works appear to comply with requirements of Specifications.

3.5.8   In no case the approval by the Employer of any document does imply compliance with neither all technical requirements nor the absence of errors in such documents. If errors are discovered any time during the validity of the contract, then the Contractor shall be responsible of their consequences.

3.5.9   For equipment and items in the scope of supply:

   a)   General arrangement drawing with full dimensions.

   b)   Electrical schematic diagram, where applicable.

   c)   Wiring diagram, where applicable.

      All Designs/Drawings/Calculations/Data submitted by the contractor, from time to time shall become the property of the Employer and Employer has the right to use or replicate such designs for future contracts / works without the permission of the Contractor. The Employer has all rights to use/ offer above designs/drawings/data sheets to any other authority without prior Permission of the Contractor.

3.6.0 FINAL DRAWINGS AND DOCUMENTS

3.6.1 The successful Contractor shall require to provide following drawings and documents for each bay constructed in printed form:

a) All approved drawings (AS BUILD) of equipment and works related to a particular bay in three (3) copies.

b) Instruction manuals of all equipment related to a particular bay in three (3) copies. These instruction manuals shall generally consist of-

      i) Operation Manuals,

      ii) Maintenance Manuals and

      iii)Spare Parts Bulletins.

c) Copies of routine test reports (in triplicate) of relevant equipment.

d) Final Guaranteed and Other technical particulars of relevant equipment.

e) In addition to the above the Contractor shall provide five (5) sets of all the drawings and documents to Employer in printed form for his reference and record.

3.7.0 APPLICATION SYSTEM SOFTWARE

3.7.1. Contractor shall provide copies of licensed copies of application software / configuration & system software in the form of CD (in duplicate) for all IEDs, meters, SAS etc.

3.8.0 QUALITY ASSURANCE, INSPECTION & TESTING

3.8.1 To ensure that the supply and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his Sub Contractor's premises or at site or at any other place of work are in, accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the Contractor and shall be finally accepted by the Employer after discussions before the award of Contract. A quality assurance programme of the Contractor shall generally cover but not limited to the following:

a) His organization structure for the management and implementation of the proposed quality assurance programme

b) Documentation control System.

c) Qualification data for Contractors key personnel.

d) The procedure for purchases of materials, parts components and selection of sub-Contractors services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.

e) System for shop manufacturing including process controls and fabrication and assembly controls.

f) Control of non-conforming items and system for corrective action.

g) Control of calibration and testing of measuring and testing equipment.

h) Inspection and test procedure for manufacture.

i) System for indication and appraisal of inspection status.

j) System for quality audits.

k) System for authorizing release of manufactured product to the Employer.

l) System for maintenance of records.

m) System for handling storage and delivery and

n) A quality plan detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of supply.

3.8.2 The Quality plan shall be mutually discussed and approved by the Employer after incorporating necessary corrections by the Contractor as may be required.

3.9.0 QUALITY ASSURANCE DOCUMENTS

3.9.1 The Contractor shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Employers inspection of equipment/material.

3.9.2   The Employer or his duly authorized representatives reserves the right to carry out Quality Audit and quality surveillance of the systems and procedures of the Contractors/his vendors Quality Management and Control Activities.

3.10.0   EMPLOYER'S SUPERVISION

3.10.1   To eliminate delays and avoid disputes and litigation it is agreed between the parties to the Contract that all matters and questions shall be resolved in accordance with the provisions of this document.

3.10.2   The manufacturing of the product shall be carried out in accordance with the specifications. The scope of the duties of the Employer, pursuant to the contract, will include but not be limited to the following:-

   a)   Interpretation of all the terms and conditions of these Documents and Specifications.

   b)   Review and interpretation of all the Contractors drawings, engineering data etc.

   c)   Witness or authorize his representative to witness tests at the manufacturer's works or at site, or at any place where work is performed under the contract.

   d)   Inspect, accept or reject any equipment, material and work under the Contract, in accordance with the Specifications.

   e)   Issue certificate of acceptance and/or progressive payment and final payment certificate.

   f)   Review and suggest modification and improvement in completion schedules from time to time, and

   g)   Supervise the Quality Assurance Programme implementation at all stages of the works.

3.11.0   INSPECTION AND INSPECTION CERTIFICATE

3.11.1   The Employer, his duly authorized representative and/or outside inspection agency acting on behalf of the Employer shall have, at all reasonable times, access to the premises and works of the Contractor and their sub-contractor(s)/sub-vendors and shall have the right, at the reasonable times, to inspect and examine the materials and workmanship of the product during its manufacture.

3.11.2   All routine and acceptance tests whether at the premises or works of, the Contractor or of any Sub Contractor, the Contractor except where otherwise specified shall carry out such tests free of charge. Items such as labour, materials, electricity, fuel, water, stores apparatus and instruments as may be reasonably demanded by the Employer/inspector or his authorized representative to carry out effectively such tests in accordance with the Contract shall be provided by the Contractor free of charge.

3.11.3   If desired by the Employer, the Contractor shall also carry out type tests as per applicable Standards for which Employer shall bear the expenses except in cases where such tests have to be carried out in pursuance to **Clause 3.13.3**. The Contractor is required to quote unit rates of type test charges in a separate Schedule (if such schedule is provided in the Bidding Document) in pursuance to this Clause. However, these type test charges shall not be taken into account in comparing Price Bid.

3.11.4   The inspection by Employer and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the Contract.

3.12.0   TESTS

3.12.1   The type, acceptance and routine tests and tests during manufacture to be carried-out on the material and equipment shall mean as follows:

   a)   Type Tests shall mean those tests, which are to be carried out to prove the process of manufacture and general conformity of the material to this Specification. These tests shall be carried out on samples prior to commencement of commercial production against the order. The Bidder shall indicate his schedule for carrying out these tests.

   b)   Acceptance Tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.

   c)   Routine Tests shall mean those tests, which are to be carried out on the material to check requirements, which are likely to vary during production.

   d)   Tests during Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the end product to be supplied by him.

   e)   The norms and procedure of sampling for these tests will be as per the Quality Assurance Programme to be mutually agreed to by the Contractor and the Employer.

3.12.1   The standards and norms to which these tests will be carried out are specified in subsequent Sections of this Specification. Where a particular test is a specific requirement of this Specification, the norms and procedure of the test shall be as specified or as mutually agreed to between the Contractor and the Employer in the Quality Assurance Programme.

3.12.2   For all type and acceptance tests, the acceptance values shall be the values specified in this Specification or guaranteed by the Bidder or applicable Standards, as applicable.

3.13.0   TYPE TEST REPORTS

3.13.1   Materials, which have never been tested for critical performance, shall not be accepted. In such cases, a promise or agreement by a bidder to have the equipment tested after award of a contract is not acceptable.

3.13.2   All Bids must be accompanied by the Type Test Certificates of materials offered (refer Clause 3.13.5below). Such type test certificates shall be acceptable only if:-

   a)   Tests are conducted in an independent **testing laboratory with NABL accreditation**, or

   b)   Tests are conducted in manufacturer's own laboratory.

   In this case (a) the laboratory must have **NABL accreditation**; and

   (b) tests have been witnessed by technically qualified representatives of earlier clients or purchaser.

3.13.3   Test reports to be acceptable must be related directly to the equipment offered i.e. it is fully identical in design, rating and construction with the equipment for which the type test certificates have been submitted. Test reports for higher class (by capacity/voltage etc.) of equipment are acceptable with commitment to perform the type tests free of any charge on the particular equipment after the award of contract.

3.13.4   Type Test Reports older than ten (10) years on the date of Technical bid opening shall not be accepted.

3.14.0   GUARANTEED TECHNICAL PARTICULARS

3.14.1   The Guaranteed Technical Particulars of the various items shall be furnished by the Bidders with the Technical Bid in the prescribed Schedules of the bidding document. The Bidder shall also furnish any other information's as in their opinion is needed to give full description and details to judge the item(s) offered by them.

3.14.2   The data furnished in Guaranteed Technical Particulars should be the minimum or maximum value (as per the requirement of the specification) required. A Bidder may guarantee a value more stringent than the specification requirement. However, for testing purpose or from performance point of view, the material shall be considered performed successfully if it achieves the minimum/maximum value required as per the technical specification. No preference what so ever shall be given to the bidder offering better/more stringent values than those required as per specification except where stated otherwise.

3.15.0   MATERIALS HANDLING AND STORAGE

3.15.1   All the supplies under the Contract as well as Employer supplied items (if any) arriving at site shall be promptly received, unloaded and transported and stored in the stores by the Contractor.

3.15.2   Contractor shall be responsible for examining all the shipment and notify the Employer immediately of any damage, shortage, discrepancy etc. for the purpose of Employer's information only. The Contractor shall submit to the Employer every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage   and erection at site. Any demurrage, and other such charges claimed by the transporters, railways etc., shall be to the account of the Contractor.

3.15.3   The Contractor shall maintain an accurate and exhaustive record-detailing out the list of all items received by him for the purpose of erection and keep such record open for the inspection of the Employer.

3.15.4   All items shall be handled very carefully to prevent any damage or loss. The materials stored shall be properly protected to prevent damage. The materials from the store shall be moved to the actual location at the appropriate time so as to avoid damage of such materials at Site.

3.15.5   All the materials stored in the open or dusty location must be covered with suitable weather-proof and flameproof covering material wherever applicable.

3.15.6   The Contractor shall be responsible for making suitable indoor storage facilities, to store all items/materials, which require indoor storage.

3.15.7   The Contractor shall have total responsibility for all equipment and materials in his custody, stored, loose, semi-assembled and/or erected by him at site. The contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss.

3.16.0 COMMISSIONING SPARES

3.16.1 It will be the responsibility of the Contractor to provide all commissioning spares required for initial operation till the Employer declares the equipment as ready for commissioning. All commissioning spares shall be deemed to be included in the scope of the Contract at no extra cost to the Employer.

3.16.2 These spares shall be received and stored by the Contractor at least 1 month prior to the schedule date of commencement of commissioning of the respective equipment and utilized as and when required. The unutilized spares and replaced parts, if any, at the end of successful completion of performance and guarantee test shall be the property of the Contractor and he will be allowed to take these parts back at his own cost with the permission of Employer's Representative.

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SECTION-4

TECHNICAL SPECIFICATIONS

4.1.0   TECHNICAL SPECIFICATIONS OF SAMAST COMPLIANT ENERGY METER

4.1.1   SCOPE

This Section is intended to cover the design, manufacture, assembly, testing at manufacturer's works of Energy Meter.

4.1.2   GENERAL

All meters shall be housed in dust proof, moisture resistant, black finished cases and shall be suitable for tropical use. They shall be accurately adjusted and calibrated at works and shall have means of calibration, check and adjustment at site.

All these instruments and meters shall be flush mounted type and back connected, suitable for panel mounting.

4.1.3

Interface Energy Meters Technical Specification

Basic Features of Interface Energy Meters

a) The energy metering system specified herein shall be used for tariff metering for bulk, inter-utility power flows, in different States of India. Static composite meter shall be installed at interface points as a self-contained device for measurement of Voltage (V), Frequency (f), Active (Wh) and Reactive (VArh) energy exchanged in each successive 5 min time block. All meters shall be compliant to IS 15959 and its latest amendments.

b) Each meter shall have a unique identification code, which shall be marked permanently on its front, as well as in its memory. All meters supplied to as per this specification shall have their identification code starting with "IEM", which shall not be used for any other supplies. "IEM" shall be an eight digit running serial number, further followed by "A" and "B" for the use with CT secondary of 1A and 5A respectively. This shall be mutually agreed between the buyer and the vendor. Note: The secondaries of all the CT cores will be 1A.

c) The meters shall be suitable for communication with external device like modem, DCU, etc. which shall be able to communicate with CDCS for local/remote data transfer. The meter shall compulsorily have at least 1 optical port for taking reading through Hand Held Unit (HHU).

d) Auxiliary Supply to IEM- The meters shall normally operate with the power drawn from DC auxiliary power supply (Range 110V to 220V DC)to reduce the Voltage Transformer (VT) burden. In addition, there shall be provision to operate the meter from the Voltage Transformer (VT) secondary circuit having a rated secondary line-to-line voltage of 110V, and current transformers (CTs) having a rated secondary current of 1 A or 5A. Any further transformers/ transactions/ transducers required for their functioning shall be in-built in the meters. Necessary isolation and/or suppression shall also be built-in, for protecting the meters from surges and voltage spikes that occur in the VT and CT circuits of extra high voltage switchyards. The reference frequency shall be 50Hz. Also, the meter shall have suitable tolerance (up to 15% either side) for DC supply.

e) The meters shall safely withstand the usual fluctuations arising during faults etc. In particular, VT secondary voltages 115% of Vref applied continuously and 190% of Vref for 3.0 seconds, and CT secondary current 150% of Iref applied continuously and 30 times of Iref applied for 0.5 seconds shall not cause any damage to or maloperation of the meters.

f) The meters shall continue to function for the remaining healthy phase(s), in case one or two phases of VT supply fails. In case of a complete VT supply failure, the computation of average frequency shall be done only for the period during which the VT supply was available in the 5-minute block. Any time block contraction or elongation for clock correction shall also be duly accounted for.

g) The total burden imposed by a meter for measurement and operation shall be defined as per IS 14697. An automatic backup for continued operation of the meter's calendar-clock, and for retaining all data stored in its memory, shall be provided through a long-life battery, which shall be capable of supplying the required power for at least 2 years. The meters shall be supplied duly fitted with the batteries, which shall not require to be changed for at least 10 years, as long as total VT supply interruption does not exceed two years. The battery mounting shall be designed to facilitate easy battery replacement without affecting PCB of the meter.

h) The meters shall fully comply with all stipulations in IS 14697 except those specifically modified by this specification. The reference ambient temperature shall be 27 ℃.

i) Each meter shall have a test output device (visual), as per clause 6.11 of IS 14697.1999, for checking the accuracy of active energy (Wh) measurement. The preferred pulsing rate is twenty (20) per Wh for CT sec-1A and four (4) per Wh for CT sec –5A. It shall be possible to couple this device to suitable testing equipment also.

j) Exception Management- The three line-to-neutral voltage shall be continuously monitored and in case any of these falls below defined threshold (70% of Vref), meter shall have suitable indication on LED/ LCD. The meter shall also have provision for low voltage event logging in meter memory in case of any phase voltage going below a defined threshold. The time blocks in which such a voltage failure occurs/persists shall also be recorded in the meter's memory with a symbol"*" if 3 Phase RMS voltage applied to the IEM is in between 5% to 70% of Vref and if Voltage is less than 5% of Vref, meter should record Zero voltage symbol "Z".

k) Time Accuracy - Each meter shall have a built-in calendar and clock, having an accuracy of 10 seconds per month or better. The calendar and clock shall be correctly set at the manufacturer's works. The date (year-month- day) and time (hour-min.-sec.) shall be displayed on the meter front on demand. Meter shall have the intelligence to synchronize the time with GPS (Local GPS/CDCS GPS/ NAVIC) signal and from PC using software. Limited time synchronization through meter communication port shall be possible at site. When an advance or retardcommand is given, twelve subsequent time blocks shall be contracted or elongated by five seconds each. Allclock corrections shall be registered in the meter's memory and suitably shown on print out of collected data.

l) A touch key or push button shall be provided on the meter front for switching on the display and for changing from one indication to the next. The display shall switch off automatically about one minute after the last operation of touch key/push button. When the display is switched on, the parameter last displayed shall be displayed again, duly updated.

m) The whole system shall be such as to provide a print out (both from the local PC, and from remote central computer) of the following format:
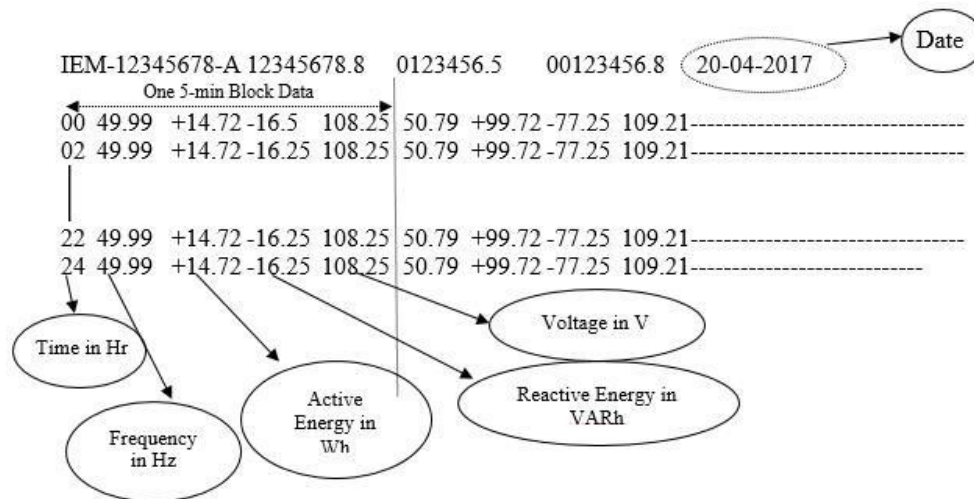

Figure 1: **Standard Raw Data Format for IEM**

There are 4 values in one 5 min time block. The first row shall contain the meter data for 2 hours, i.e. 24 time blocks, 00 hrs to 02:00 hrs. Similarly the 2nd row shall contain the data for the next 2 hours and henceforth.

The above data shall be available in text file format (file extension as per IEEE standard/.txt) exportable to Excel. Indication of time retard or advance to be provided without disturbing the proposed format. Each 5-min block data consists of Frequency (in HZ), Active energy (in Wh), Reactive energy (in VARh) and Voltage (in V). All 5 minute Wh and VARh figures in .NPC/output report shall be rounded off upto third decimal.

n) The portable hand held unit (HHU)/ Common meter reading instrument (CMRI)/ Data Collecting Device (DCD) shall be having IS-15959:2011 compatibility for standardized parameters. The optical coupler for tapping data stored in the SEMs memory shall be compatible universally across different make of SEMs.

Constructional Features

a) The meters shall be supplied housed in compact and sturdy, metallic or moulded cases of non-rusting construction and/or finish. The cases shall be designed for simple mounting on a plane, vertical surface such as a control/relay panel front. All terminals for

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CT and VT connections shall be arranged in a row along the meter's lower side. Terminals shall have a suitable construction with barriers and cover, to provide a secure and safe connection of CTs and VTs leads through stranded copper conductors of 2.5 sq. mm. size.

b) All meters of the same model shall be totally identical in all respects except for their unique identification codes. They shall also be properly sealed and tamper evident, with no possibility of any adjustment at site, except for transactions allowed in IS 15959.

c) The meters shall safely withstand, without any damage or mal operation, reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. in accordance with IS-14697. They shall have an IP-51 category dust-tight construction, and shall be capable of satisfactory operation in an indoor, non- air conditioned installation.

d) Either the meters shall have built-in facility (e.g. test links in their terminals) for in-situ testing, or a separate test block shall be provided for each meter.

Measurement

i. The active energy (Wh) measurement shall be carried out on 3-phase, 4-wire principle, with an accuracy as per class 0.2S (IS 14697).

ii. The meter shall compute the net active energy (Wh) sent out from the substation bus bars during each successive 5 min block, and store it in its memory up to fourth decimal with plus sign if there is net Wh export and with a minus sign if there is net Wh import. Further Wh data in .NPC/output report shall be rounded upto third decimal.

iii. The meter shall count the number of cycles in VT output during each successive 5 min block, and divide the same by 300 (60 sec/min x 5min) to arrive at the average frequency. The frequency data shall be stored in the meter's memory in Hertz up to third decimal. Further Frequency data in .NPC/output report shall be rounded off upto second decimal.

iv. The meter shall continuously compute the average of the RMS values of the three line-to-neutral VT secondary voltages as a percentage of 63.51 V, and display the same on demand. The accuracy of the voltage measurement/computation shall be at least 0.5%, a better accuracy such as 0.2% in the 95-105% range being desirable. The voltage data shall be stored in the meter's memory in volts up to third decimal. Further voltage data in .NPC/output report shall be rounded off upto second decimal.

v. The Reactive energy (VARh) measurement shall be carried out on 3-phase, 4-wire principle, with an accuracy of 0.5S as specified in IS 14697. The meter shall compute the net Reactive energy (VARh) sent out from the substation bus bars during each successive 5 min block, and store it in its memory up to fourth decimal with plus sign if there is net VARh export and with a minus sign if there is net VARh import. It shall also display on demand the net VARh sent out during the previous 5 min block. Further VARh data in .NPC/output report shall be rounded off upto third decimal.

vi. The meter shall also integrate the reactive energy (VARh) algebraically into two separate registers, one for the period for which the average RMS voltage is above 103.0%, and the other for the period for which the average RMS voltage is below 97.0 %. The current reactive power (VAR), with a minus sign if negative, and cumulative reactive energy (VARh) readings of the two registers (>103% and <97%) shall be displayed on demand. The readings of the two registers at each midnight shall also be stored in the meter's memory. When reactive power is being sent out from substation bus bars, VAR display shall have a plus sign or no sign and VARh registers shall move forward. When reactive power flow is in the reverse direction, VAR display shall have negative sign and VARh registers shall move backwards. Generally, the standard PT ratios are 132kV/110V, 220 kV /110 V, 400 kV /110 V and 765 kV / 110 V. However, at the time of commissioning the vendor may confirm the same from site and configure the meter accordingly to ensure correct recording of reactive energy.

vii. For CT secondary rating of 5A, all computations, displays and memory storage shall be similar except that all figures shall be one fifth of the actual, worked out from CT and VT secondary quantities.

viii. Further, the meter shall continuously integrate and display on demand the net cumulative active energy sent out from the substation bus bars up to that time. The cumulative Wh reading at each midnight shall be stored in the meter's memory. The register shall move backwards when active power flows back to substation bus bars.

ix. Errors for different power factors shall be as defined in IS14697.

x. For reactive power (VAR) and reactive energy (VARh) measurements, IS14697 shall be complied with. The accuracy of measurement of reactive energy shall be as per class 0.5S.

xi. The harmonics shall be filtered out while measuring Wh, V and VARh, and only fundamental frequency quantities shall be measured/computed.

xii. Data security shall be ensured as per IS 15959 (three layers of security).

Memory/ Storage

i. Each meter shall have a non-volatile memory in which the following shall be automatically stored:

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ii.   Average frequency for each successive 5 min block, in Hertz up to third decimals.

iii.   Net Wh transmittal during each successive 5 min block, up to fourth decimal, with plus sign if there is net Wh export and with a minus sign if there is net Wh import.

iv.   Net VARh transmittal during each successive 5 min block, up to fourth decimal, with plus sign if there is net VARh export and with a minus sign if there is net MVARh import.

v.   Cumulative Wh transmittal at each midnight, in eight digits including one decimal.

vi.   Cumulative VARh transmittal for voltage high condition, at each midnight in eight digits including one decimal.

vii.   Cumulative VARh transmittal for voltage low condition, at each midnight, in eight digits including one decimal.

viii.   Average RMS voltage for each successive 5min block.

ix.   Date and time blocks of failure of VT supply on any phase, as a star (*)/ (Z) mark.

x.   The meters shall store all the above listed data in their memories for a period of fifteen (15) days. The data older than fifteen (15) days shall be erased automatically

xi.   The software provided at CDCS, i.e. SLDC, will manage all functionalities of collection of data through DCUs, validate the data, store the data in a database, and manage the complete system. Software will also have a scheduler for scheduling the task of collection of data periodically. The periodicity of data collection shall be user defined.

Display

Each meter shall have digital display for indication of the following (one at a time), on demand:

i.   Meter serial no. and model : IEM12345678A or IEM12345678B

ii.   Date (year month day /yyyy mm dd) : 20160311 d

iii.   Time (hour min sec /hh mm ss) : 195527 t

iv.   Cumulative Wh reading : 1234567.8 C

v.   Average frequency of the previous block : 49.89 F

vi.   Net Wh transmittal during the previous block: - 28.75 E

vii.   Net VARh transmittal during the previous block: - 18.75 R

viii.   Average % Voltage : 99.2 U

ix.   Reactive power (VAR) : 106.5 r

x.   Voltage - high VARh register reading : 1234567.5 H

xi.   Voltage - low VARh register reading : 1234567.4 L

xii.   Low battery indication

xiii.   The three line-to-neutral voltages shall be continuously monitored and in case any of these falls below 70 %, a preferably flashing three LEDs (one LED/phase) provided on meter's front shall become steady. They shall go off if all three voltages fall below 70 %. The LED shall automatically resume flashing when all VT secondary voltages are healthy again.

xiv.   The two VARh registers (xv and xvi) shall remain stay-put while VT supply is unhealthy.

Any other better or more informative mechanism to display the above shall be preferred. The above shall be mutually agreed between the meter buyer and vendor.

Navigation keys to be provided at the meter front plate to navigate the display menu.

Communication

Each meter must have an optical port on its front for tapping all data stored in its memory through HHU. In addition to the above each meter shall also be provided with a RS-485, Ethernet and USB port on one of its sides, from where all the data stored in the meter's memory can also be transferred to CDCS (through DCU), local computer and external storage. The overall intention is to tap the data stored in the meter's

memories at a scheduled time from any of the above mentioned ports or any other means and transmit the same to a remote central computer using suitable means of communication. It shall be possible to securely download the IEM data through an USB port via external storage thereby removing the requirement of a MRI (Meter Reading Instrument). It shall be ensured that data transfer through USB shall be unidirectional only i.e. from Meter to external storage device in an authentication process. Meter data shall be tamper- proof.

All meters shall be compatible with Optical port, RS-485 port, Ethernet port and USB / RS-232 port all together at a time and communicate independently. It shall also be possible to obtain a print out (hard copy) of all data collected from the meters, using the local PC. Data collection from any local laptop/PC shall be possible by installing data collection software. Entire project has to be based on Optic Fibre/GSM/4G/3G. Tenderer should quote considering availability of Optic Fibre at 80% of locations and availability of PLCC/4G at 20 % of locations. This is for bringing all the tenders on common platform. However the selected agency will have to conduct detailed survey regarding availability of the particular service for all locations. The Tenderer may conduct Field Survey before submission of tender.

The Tenderer shall adhere to the appropriate security algorithm for encryption and decryption

Entire project has to be based on Optic Fibre/GSM/4G/3G. Tenderer should quote considering availability of Optic Fibre/PLCC/4G/3G/2G for all the locations. However the selected agency will have to conduct detailed survey regarding availability of the particular service for all locations. Tenderers may do Site Survey for availability of communication media prior to submission of tenders.

The Tenderer may design appropriate architecture for providing end to end metering solution. He is free to decide upon the best solution out of all the available options to ensure that data from all IEMs in ASSAM are available at State Load Despatch Centre by the scheduled time. However, the entire responsibility of fully functional end to end metering system shall rest with the Tenderer in order to meet the performance levels as given in this document. The communication provider may adopt Optical Fibre/GSM/3G/4G communication technology or a combination of these technologies as per the site requirement adopting best available technology in the proposed area of implementation. The successful Tenderer shall be responsible for proper data exchange among IEM, DCU, CDCS, MDP and other operational/requisite software as part of fully functional metering system.

The Tenderer shall design a reliable, interference free & robust communication network keeping in view the site conditions. It shall be flexible in terms of providing communication in variable terrain & urban density. The Tenderer shall design the network architecture keeping in view the existing and planned infrastructure of the utility. During designing, suitable consideration shall be kept for future expansion as per requirement of Utility. Before designing the communication network, the Tenderer shall do the site survey and would provide the most efficient communication infrastructure. The entire infrastructure & associated civil works required for installation & commissioning of equipment/devices like DCUs, repeaters, routers & access points etc. shall be in the scope of Tenderer. The operational testing of all the network elements has to be demonstrated by the Tenderer to the satisfaction of the utility.

The Tenderer shall provide the necessary software which would enable a local PC/ CDCS to:

Accept the data from the Optical/Ethernet/WAN and store it in its memory in user defined formats (text, csv, xls, etc.) in a user-defined file name (file name format must be ddmmyy substation name-utility name).

Polling feature along with a task scheduler to run the data downloading software at a pre-designated date and time repeatedly or by manually selecting a meter. File naming for such downloaded data should also be in user-defined format. A detailed activity log shall also be available for each downloading operation.

Upload/Import meter data (binary files) in the software for further processing. While uploading, there shall be provision to upload all selected files with single key-stroke.

Convert the binary file(s) to text file(s).There should be provision to select multiple files based on filename, convert all selected files with single key-stroke and store the text files in the same location where binary files are stored.

Display the collected data on PC's screen in text format, with forward/backward rolling

Print out in text format the data collected from one or more meters, starting from a certain date and time, as per operator's

instructions

Transmit the collected data, in binary format, through an appropriate communication link to the central computer, starting

from a certain date and time, as per operator's instructions.

Store the collected data in binary format, on a CD/Pen Drive. In addition to above, in general the software shall be able to convert IEMs data to existing format as well as in tabular (.csv) format as applicable.

The above software shall further ensure that absolutely no tampering (except erasing of complete data with password protection) of the collected metering data is possible during its handling by the PC. The software shall be suitable for the commonly available PCs, (Windows) and shall be supplied to Owner in a compatible form to enable its easy loading into the PCs available (or to be installed by the Owner/others) at the various substations.

The Tenderer shall ensure data integrity checks on all metered data received from data collection systems.

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

Climatic Condition

The meters to be supplied against this specification shall be required to operate satisfactorily and continuously under the following tropical conditions of hot, humid, dusty, rust and fungus prone environment.

Maximum ambient air temperature (°C)	55
Minimum ambient air temperature (°C)	(-) 5
Average Daily ambient air temperature (°C)	32
Maximum Relative Humidity (%)	95
Minimum Relative Humidity (%)	10
Maximum altitude above sea level (m)	1000
Average Annual Rainfall (mm)	1200
Maximum Wind Pressure (Kg/sq.m)	195
Isoceraunic Level (days per year)	50
Seismic Level (Horizontal Accn. In g)	0.3

Quality Assurance

The quality control procedure to be adopted during manufacturing of the specified equipment shall be mutually discussed and finalized in due course, generally based on the established and proven practices of the manufacturer. The software shall be user friendly which can be easily installed in any PC/Laptop irrespective of operating system of the PC/Laptop, and shall be certified for ensuring data handling capabilities. The same shall be demonstrated by the party during technical evaluation. During demonstration party shall bring standard meter. Thereafter software shall be offered for technical compatibility before taking up further necessary action in the procurement process.

Testing

All equipment, after final assembly and before dispatch from manufacturer's works, shall be duly tested to verify that is

suitable for supply to the Owner. Routine and acceptance tests shall be carried out on the meters in line with IS 14697. Any meter which fails to fully comply with the specification requirements shall be liable to be rejected by the Owner. However, the Owner may purchase such meters at a reduced price in case of marginal non-compliance, at his sole discretion.

Acceptance Tests for PC Software and data down loading using meter communication ports- All IEMs after final assembly and before despatch from Tenderer's/Manufacturer's works shall be duly tested to verify that they are suitable for downloading data using meter communication ports shall be subjected to the following acceptance test.

Downloading Meter Data from the Meter(s) to PC via optical port. Downloading meter data through USB port and RS 232.

Downloading meter data to DCU/CDCS through Ethernet as well as RS 485 port. Compatibility with PC Software.

Functioning of Time synchronisation, advance and retard time commands. Per meter downloading time verification.

Copy of Certificate shall be submitted to SLDC

Type Tests

One (1) meter in a batch shall be subjected to the complete range of type tests as per IS14697 and IS15959, after final assembly. In case of any failure to pass all specified tests, the Tenderer shall arrange to carry out the requisite modifications/replacements in the entire lot of meters at his own cost. After any such modifications and final assembly, two (2) meters selected out of the lot by the Owner's representative shall be subjected to the full range of type tests. The lot shall be accepted by the Owner only after successful type testing.

The meters used for type testing shall be separately identified, duly marked, and supplied to the Owner in case they are fully functional and as good as other (new) meters, after necessary touching up/refurbishing. In case this is not possible, the Tenderer shall provide their replacements at no extra cost to Owner.

The Tenderer shall arrange all type testing specified above, and bear all expenses for the same. Copy of Test certificate shall be submitted to SLDC.

ANOMALY DETECTION FEATURES

The meter shall have features to detect and log the occurrence and restoration of following anamolies, along with date and time of event:
6.1.1. Phase wise Missing Potential – The meter shall detect missing potential (1 or 2 phases) provided the line current is above a specified threshold. The voltage at that stage would be below a specified threshold.

Phase wise Current Circuit Reversal – The meter shall detect reversal of polarity provided the current terminals are reversed. This shall be recorded for 1 or 2 phase CT reversal.

Voltage Unbalance – The meter shall detect voltage unbalance if there is unbalance in voltages.

Current Unbalance – The meter shall detect current unbalance if there is unbalance in load conditions. Meter should ensure true system conditions before going for current unbalance checks.

CT Miss – The meter shall detect current miss if the current is below a defined threshold, provided the phase voltage is above a specified threshold. Snapshots of phase wise voltage, phase wise active current and phase wise power factor shall be provided with above specified anomaly events. Further, each meter module shall record the following events along with total duration:

Power On/Off – The meter shall detect power off if both the auxiliary supplies fail. The event shall be recorded on the next power up. At the same time power on event shall be recorded. No snapshot shall be logged with this event.

Feeder Supply Fail -This event shall be logged when feeder supply, i.e. all the voltages goes below certain threshold. No snapshot shall be logged with this event.

Last three hundred & fifty (350) events (occurrence + restoration), in total, shall be stored in the meter memory on first in first out basis.

There shall be five separate compartments for logging of different type of anomalies :

Compartment No. 1	100 events of missing potential
Compartment No. 2	100 events of CT reversal
Compartment No. 3	100 events of power failure/ Power on-off
Compartment No. 4	50 events of transaction related changes as per ICS Category B

Once one or more compartments have become full, the last anomaly event pertaining to the same compartment shall be entered and the earliest (first one) anomaly event should disappear. Thus, in this manner each succeeding anomaly event shall replace the earliest recorded event, compartment wise. Events of one compartment/ category should overwrite the events of their own compartment/ category only. In general persistence time of 5 min. for occurrence and restoration respectively need to be supported in meter.

Anomaly count should increase as per occurrence (not restoration) of anomaly events. Total no. of counts shall be provided on BCS.

Installation and Commissioning

The static energy meters specified above shall be installed at various EHV substations owned by the Owner, ISTS licensee, Inter State Generating Stations, DISCOMs and other agencies, throughout NER. The tentative list of substations along with the existing number of meters shall be as per site survey. The exact location for installation shall be provided by the Owner.

The Tenderer shall be responsible for total installation and commissioning of the meters (along with test blocks, if supplied separately) as per Owner's advice, including unpacking and inspection on receipt at site, mounting the meters on existing control and relay panels at an appropriate viewing height, connection of CT and VT circuits including any required rewiring, functional testing, commissioning and handing over. The Tenderer's personnel shall procure/carry the necessary tools, equipment, materials and consumables (including insulated wires, lugs, ferrules, hardware etc.)

As part of commissioning of DCDs the Tenderer shall load the software specified in clause 5(d) into the PCs at the respective substations, and fully commission the total meter reading scheme. He shall also impart the necessary instructions to substation engineers. At least 2-hour training session shall be arranged for substation staff and SLDCs. Also, an operating manual (pdf as well as hard copy) of the meter containing all details of the meter, various data downloading features, etc. shall be made available at site and SLDC.

Tenderers to check the dimensions of the existing SEM's. IEMs shall fit in the same location in the panel.

Following technical information shall be furnished by the Tenderers in their offers:

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- Foreseen dimensions of proposed meter

- Expected weight of proposed meter

- Dimensions and weight of the test block, if supplied separately.

At the time of commissioning, the meters lying in stores shall be time synchronized through GPS signal before installation in the panel to avoid the large time mismatch.

General

The meter shall be supplied with latest/compatible software (shall be compatible with old & new meters data download handling). Any new software as required to be installed within warranty period are to be done by party or through remote support to client.

The total arrangement shall be such that one (1) operation (click on "data down load from meter" button on software) can carry out the whole operation in about five (5) minutes per meter or preferably faster.

The layout of software front end/user interface has to be approved by RLDC during technical evaluation/demonstration. However, a standard template sheet will be provided along with TENDER for reference.

Software for windows/office/antivirus to be supplied. Antivirus should not slow down processes and same will be demonstrated during technical demonstration. Above specification is minimum only, any higher standard required for the purpose intended (meter data handling) would be assessed by vendor and would be supplied accordingly. The detailed architecture shall be approved during drawing approval stage.

Meter shall be accommodated in existing C&R panel of standard size (Alstom/ ER/ABB/Siemens) in kiosk or C&R panel with door closed. If required before TENDERding, Tenderer may collect necessary data or else the scope is deemed to be included.

Step by Step procedure (on screen shot type and desktop video capture) shall be provided for

- Installation/Re-installation of Database handling software in to Laptop / PC

- Meter maintenance/site-testing procedure as per relevant IS/IEC standard

- Procedure for data downloading from Meter by HHU/Laptop/Desktop PC.

As on date of delivery, the supplied meters shall comply with all statutory regulation as required under CERC/CEA/IEGC as applicable and the same should be declared by the vendor during delivery along with warranty certificate.

Tenderer is responsible for dismantling of old special energy meters and to purchase on buy back basis on successful installation of interface energy meters.

Dismantling / Buy-Back of Existing SEM

Dismantling of existing SEMs and taking it, away shall also be in the scope of Tenderer. Warranty

The IEM shall be under warranty as per OEM standard Warranty Policy. The Tenderer shall be responsible for meter testing as per CEA metering regulations.

The warranty would include repair, replacement, part material replacement cost and one way (return) transportation cost (including insurance of transit)

Meter software, if upgraded by OEM should be supplied free of cost with initiation taken from party. Remote service person name to be indicated during tendering.

Meters which are found defective/inoperative at the time of installation or become inoperative/defective within the warranty period, these defective/inoperative meters shall be replaced within one week of receipt of report for such defective/inoperative meters

Copy of warranty certificate shall be submitted to owner STANDARDS TO BE COMPLIED WITH

Standards to be complied

S.No	Reference	Reference Title
	Detail	
1	IS-15959:2011	Data Exchange for Electricity Meter Reading Tariff &
		Load Control – Companion Specification
2	IS-14697:1999	Specifications for AC Static Transformer operated Watt
		Hour & VAR-Hour meters, class of 0.2S and 0.5S

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3	IEEE 830-1998	IEEE Recommended Practice for Software
		Requirements Specifications

AMR System Overview

AUTOMATED METER READING or AMR, as the name suggests is a system used for automating the Meter data collection process. AMR to retrieve data from Energy Meters installed in the substation/ Switchyards has to be primarily based on GPRS/4G/3G network and fibre optic communication, where ever available. However in case GPRS/4G/3G network is not available at any location, then any reliable communication service like Broadband & Satellite Communication may be used for communication with CDCS.

Meters with RS 485/Ethernet port shall be interfaced with Data Concentrator unit to be installed at the substation. Each DCU shall collect and communicate meter data to CDCS server i.e. MDAS(Meter Data Acquisition Software) installed at the central data center located in each SLDC.

The intent of AMR scheme proposed in this document is to automate the task of data collection from each meter/location to the Central Data Collection System (CDCS) followed by validation, processing and generation of customized reports. The data shall be stored in RDBMS database located at respective CDCS server(SLDC).

The communication system for data transfer from IEM to SLDC shall be in the scope of the Tenderer. Concept diagram of the envisaged AMR system is given in Figure
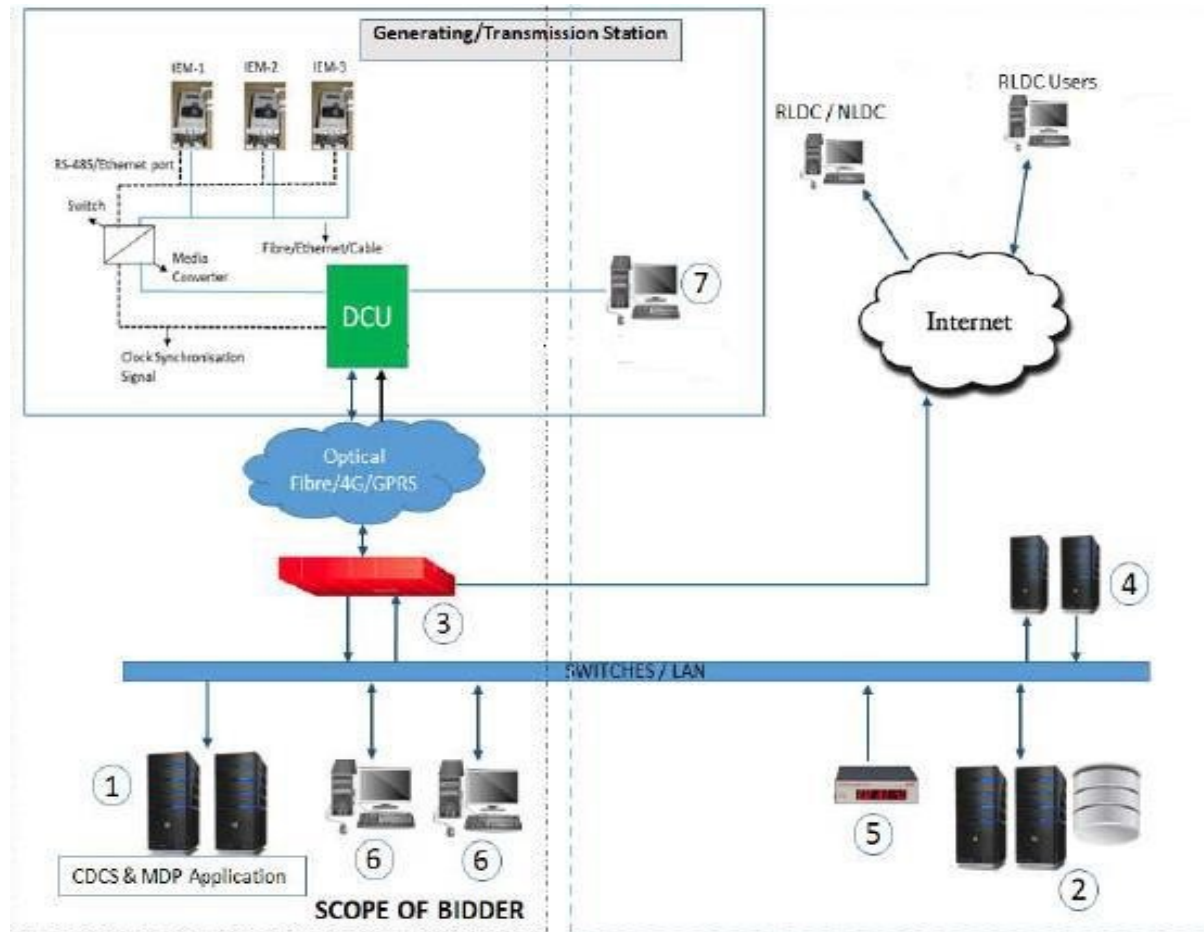

Figure 2: Concept Diagram of Envisaged AMR System

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AMR Software Features

AMR shall be provided for collection and processing of data from ABT(IEM) meters (as specified by SAMAST committee) installed at remote Substations. AMR architecture may include the following 4 parts:

- Data Concentrator Unit (DCU)
- Communication System
- GPS clock
- Centralized Data Collection subsystem (CDCS) (including CDCS server and MDAS software).

Data Centre Communication Server (CDCS) software shall perform following functions:-

- Communication with DCUs
- Collection of energy meter data
- Collection of status data from DCU
- Remote Configuration of DCU
- Processing of energy data
- Storing of data
- Reporting functions for network and communication
- Monitoring and Alarming
- Audit trail and logging.

Data Concentrator Unit

A Data Concentrator Unit (DCU) installed at each location will act as interface between Central Data Collection System (CDCS) at SLDC and IEMs installed at that location.

DCU shall collect data from energy meters and sent the same to CDCS at SLDC.

DCU shall also report diagnostic information of the energy meters to CDCS. DCU shall have following functions: - Acquiring energy data and status from energy meters.

Providing energy data and status to CDCS
Providing energy data and status to local computer.

Intelligence to synchronize IEMs clock with with GPS clock located at CDCS.

Each meter has a unique identification number and each meter location has unique Identification code. DCU shall collect data from a single or group of meters based on meter number and meter location code. DCUs shall collect data from energy meters and transfer the same to CDCS. DCUs should provide a RS-485/Ethernet/USB port for Communication with local personal computer or terminal.

Central Data Collection System

A Central Data Collecting System provided at SLDC will manage all functionalities of collection of data through DCUs, validation and verification of the data, storage of the data in a database with RAC and with HA (High availability provided by remote mirroring of database storage) and management of the complete AMR system. CDCS shall have a scheduler for scheduling the task of collection of data periodically up to the last time block. Provision of extracting data from the database in the text files as per existing format for all or selected meters for further processing by Energy Accounting software is also to be built in data collection software. The responsibility of providing data up to CDCS (including all the hardware in between) shall be the responsibility of the Tenderer.

The Supplier shall supply, install and commission the CDCS server including the MDAS software on the CDCS server. The awardee under the tender "Supply, Installation, Testing and Commissioning of IT solution as part of Scheduling, Accounting Metering and Settlement of Transaction (SAMAST) system at State Load Dispatch Centre in the North Eastern States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura" shall install the housing/rack for CDCS server and associated equipments in the SLDC premises and make the same available to the Tenderer under this tender as per the project milestone of the former tender.

Communication System

For the purpose of this project communication media i.e. Fiber Optic/GPRS shall be provided by the respective utility. However for the Pilot Supplier will have responsibility to establish the same. Communication system to be used for transfer of data from DCU to CDCS may be through Optic fibre /GSM-2G/ 3G/ 4G. Tenderer is free to suggest alternative reliable communication

media if it is more efficient and cost effective. The Tenderer may conduct field survey for the same prior to submission of tender.

Scope of Work

This section provides detailed scope of work included in the Tenderer's scope, excluded from the Tenderer's scope,

facilities to be arranged by Tenderer and facilities to be provided by station owner. Tenderer's Scope of Work

The scope of work in complete conformity with subsequent sections of the specification shall include site survey(prior to tendering and during execution), planning, design, engineering, manufacturing/integration, FAT test , supply, transportation & insurance, delivery at site, storage, installation, commissioning, demonstration for site acceptance, training and documentation of AMR system including:

- Design Document for complete AMR System.

- Software Requirements Specifications for CDCS/MDAS and DCU.

- MDAS output format shall include exposing APIs (in Json format).

- Application Server Database System and Central Data Collection System (CDCS) at SLDCs.

- CDCS server along with Router for installation of MDAS (Meter Data Acquisition System) at SLDC.

- Making data available up to CDCS system at SLDC.

- Data Collection Unit (DCU)

- Connection and interfacing of meters with DCU.

- Supply and laying of optical fiber at the stations for connection of IEM to DCU wherever the Ethernet/serial communication not feasible

- GSM/GPRS/ Modems, Media converter, Switch

- Communication channels between each DCU and CDCS.

- All cabling, wiring, terminations and interconnections of the equipment.

- Database development, Displays and Reports.

- Archival and retrieval of data through database with RAC and with HA (High availability provided by remote mirroring of database storage) database at SLDC.

- Decoded text files in existing format at SLDC.

- Periphery segregation shall be in line with established cyber security standards.

- Training of personnel (Substation, SLDC and other divisions of the respective state utility)

- Warranty for 1 years. The intent of the project is that the Tenderer shall ensure 100% data availability at SLDC within the stipulated time as per IEGC within the warranty period.

- To maintain extra 20% quantity of AMR equipment as backup and future requirement.

Exclusions from Tenderer's Scope of Work

Followings are not included in the scope of the Tenderer and shall be provided by local station without any extra cost to Tenderer: -

- Space for installation of IEMs, DCU, CDCS at respective locations

- Auxiliary Power Supply for IEMs, DCU at each location and server system at CDCS

- Provision of static IP and internet connection at SLDC

- Building, air conditioning systems and other infrastructures.

- PC required for data downloading at each location with connector. Local site shall arrange for the same.

- In case of GPRS communication SIMs have to provide by the Owner.

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- Any other work which is not identified in the specification but is required for completion of the project within the intent of this specification shall also be in the scope of the Tenderer without any extra cost.

- Fixed public IP shall be provided for the internet landing point at central location to connect the GPRS/ Internet network to MDAS.

Functional Requirements:

Major components of the AMR System to be implemented under the scope of this specification document are

- Data Concentrator Unit

- GPS clock

- Central Data Collection System (CDCS) or Meter Data Acquisition System (MDAS).

- Communication channel

This section enumerates the functional requirements of each component. Data Concentrator Unit (DCU)

DCU is to function as a gateway between Central Data Collection System (CDCS) and energy meters installed at DCU location. DCU shall have following functions: -

- Acquiring energy data and status from energy meters.

- Providing energy data and status to CDCS.

- Providing energy data and status to local computer.

- Time synchronization of IEM's, either through GPS installed at site or through CDCS

- Provision for Interface between DCUs

Application Requirement: Data Concentrator Unit (DCU) along with the suitable enclosure shall be placed in the control room in the Substation/ Generating Plant. DCU is functionally requires to acquire the IEM data and transferring the same to Data Control Center (SLDC) using communication system and AMR software.

General Construction

DCU shall be a self-contained, stand-alone box with minimum 1 serial (RS485) port for meter connection and with one RJ45 Ethernet 10/100/1000mbps port. DCU shall have in built modem or external modem facility. DCU shall have MODBUS port in addition to DLMS.

DCU should be flush mounted or surface mounted and to be supplied with suitable enclosure for installation in the control room. The enclosure shall be complete with the internal wining and have all the necessary arrangement for the termination of various communication and power cables in the enclosure.

DCU should be of reputed make and should be field tested in similar application for central govt /state govt./PSU etc. DRS/data sheet approval will be taken during drawing approval stage

The DCU shall be normally powered from the station battery backup supply rated at 110/220 VDC/ 230VAC. DCU should have protection against entry of dust.

Substantial EMI (Electro Magnetic Interference) and ESD (Electro Static Discharge) will be present at DCU site, effect of which shall be duly considered while designing the system. Performance of the overall system shall not be hampered by such interference. EMI/ESD tolerance shall comply with IEC61850-3 guidelines.

DCU should be able to operate in environment with temp up to 45°C and humidity up to 90% without any significant effect on its performance.

The mechanical design and construction of each unit sub-assembly shall be inherently robust and rigid under various conditions of operation, adjustment, replacement, storage and transport.

DCUs shall also withstand without any damage or mal-operation reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. They shall have an IP-54 or better category dust-tight construction, and shall be capable of satisfactory operation in an indoor, non-air-conditioned installation.

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Local Display and LEDs for status like power on, communication activity etc should be provided on the face of DCU.

Acquiring energy and status data from energy meters

DCUs shall be connected with local energy meters through Ethernet/Serial/USB optical fiber with suitable media converter/ switches in between. All communication between meters and CDCS via DCU should be firm and secure from any unintended disconnection. DCU should implement IEM protocols (IS 15959- Data Exchange for Electricity Meter Reading Tariff & Load Control – Companion Specification). It shall be possible to change/update the energy meter protocol driver from CDCS. DCU shall store the energy data from the meters for at least 15 days in its memory. DCUs shall not send any command other than the command to read the energy data, status data and GPS clock synchronization of IEM clock.

DCU shall be capable of synchronizing with GPS locally/Remote and transfer the synchronizing signal to all the IEMs connected to it. The necessary ports for time synchronization shall be made available. Status means data healthiness check of DCU & Communication channel and any status given by meter.

Providing Energy Data and Status to CDCS

DCUs shall be provided with suitable SIM/modem etc. in order to have connectivity over Optic Fibre /GSM/ 3G/ 4G with SLDC. All communication between DCU and CDCS shall be on secure VPN with two IP address. DCU shall accept following commands from CDCS/GPS Clock and shall function as per the command:

Energy data collection from energy meters. Acquiring status and alarm from energy meters.

Modification of DCU Configuration through remote access from CDCS. IEM clock synchronization with GPS clock from CDCS.

The DCU should be compatible with two SIM's and should have provision for Ethernet connectivity with fall back option

between them. Tenderer may supply separate modem with DCU as per technical specifications specified herein.

Transfer of data from DCU to MDAS should be on physical Ethernet and secured VPN form. The DCU should be able to run the meter protocol drivers to read each type of meter and transfer them to the Control Centre. The DCU must support DLMS/COSEM (HDLC & TCP) as well as MODBUS to communicate with meters.

Energy Data Collection

DCUs shall query energy data and transfer the same to CDCS based on the command received from CDCS. Command may be for one time demand of data or it may be on cyclic basis. DCU shall be able to query data from all or selected energy meters for the selected period based on the command from CDCS. DCUs shall be able to read energy data from all make of energy meters available in the market like L&T, Secure and Genus etc.

Each meter has a unique identification number and location identification code. DCU shall collect data from a single or group of meters based on meter number or meter location code.

DCU shall receive complete data from energy meters and send the same to CDCS within specified time guaranteed by the vendor. This performance requirement shall be met under the maximum number of IEMs as specified for the delivered as-build or expanded system.

Providing energy data to local computer

DCUs shall provide RS-485/Ethernet/USB port for communication with local personal computer or terminal. DCU shall provide meter status, alarm etc. and energy data to local personal computer, if required. Local PC shall be able to query energy data from selected or all energy meter by using web browser and intuitive user interface. The web browser shall be same as CDCS web browser to access the IEMs installed at local station. No special software should be required to be installed at local computer for this communication. All communication with local computer shall be password protected. PC for data downloading at each DCU location shall be arranged by respective site.

Status Data Collection

DCUs shall query periodically all energy meters connected to it for status or any alarm etc. Any change in status or alarm shall be reported to CDCS immediately.

DCUs shall acquire connected energy meter details like meter identification number, make, Low Voltage flag etc. periodically as well as whenever it's powered on. Any meter change activity like meter number, Low Voltage flag etc. shall be reported to

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CDCS immediately. DCUs shall be self-monitoring for alarm like power failure, communication disconnection, and disconnection from energy meters and report the same to CDCS immediately. DCUs shall have non- volatile memory for storing status data of energy meters duly time stamped, details of connected meters like make, meter number, status change. Non-volatile memory should be able to store such data for at least one month in round

FIFO buffer.

Time Synchronization of Meters

DCU shall have the intelligence to synchronize the IEM clock time with updated RTC clock time. DCU will get GPS clock reference from its respective CDCS (at SLDC) / local GPS clock and synchronize RTC clock time in DCU. The RTC of DCU should retain its synchronized clock signal without any drift for at least 12 hrs.

The CDCS/MDAS Software should generate a report of the drift between the Meter time and DCU time for the purpose of reconciliation.

DCU Configurations change

Each DCU shall have a unique identification number normally not required to alter at site. DCUs shall accept and respond command for making configuration changes in DCU like periodicity of energy data/status data collection/GPS clock signal for IEM clock synchronization. For each configuration change, DCU shall respond with task successful or failure message to CDCS. Configuration commands from CDCS may be in the form of single command or multiple commands in a command file.

DCU shall accept and make changes in configuration through data command on Optical fibre /GSM-2G/ 3G/ 4G. DCU shall receive the configuration command from CDCS on same channel used for transfer of data to CDCS. DCUs shall store all configuration data locally in a separate non-volatile memory. All changes to configuration shall take place first to this memory. Only after receiving a specific command from CDCS, the saved configurations should come into effect. However, any other functionality should not get affected during accepting and responding to configuration commands from CDCS. DCUs are not required to store history of configuration changes as all history shall be maintained in CDCS.

Similarly, it shall be possible to upgrade the DCU firmware remotely from CDCS based single or multiple commands from CDCS. The firmware upgrade shall come into effect only after receiving the specific command from CDCS. The DCU shall immediately send the status of firmware upgrade to the CDCS and shall provide the old as well as new firmware versions.

It shall also be possible to roll back the firmware upgrade if required.

Type Test Requirements of DCU (Tenderer should provide valid type test certificates along with the bi document)

List of Type Tests for DCU

Type Test Requirements of DCU	
Conducted Emission	CISPR 22: 2008-09, Ed 6.0 EN55022:2006/A1:2007 on power lines and signal ports
Radiated Emission	CISPR 22: 2008-09, Ed 6.0 EN 55022:2006+A 1:2007 Class A 30Mhz to 1000Mhz
Electrostatic Discharge	IEC 61000-4-2:2001 - ±8 kV Contact Discharge, ± 15 kV Air Discharge
Radiated Susceptibility	IEC 61000-4-3: 2006 -80 - 1000 MHz : 10V/m 80% AM, 1 kHz sine wave
Electrical Fast Transient	IEC 61000-4-4:2004 - ±4 kV serial ports, Ethernet port, DC Power Ports
Surge Protection	IEC61000-4-5:- 2011 Serial port ± 4kV, 1.2/50 µs for common mode, Ethernet port ± 2kV, 1.2/50 µs for common mode DC Power port ± 2kV, 1.2/50 µs for common mode, ± 1kV, 1.2/50 µs for differential mode AC Power port ± 4kV, 1.2/50 µs for common mode, ± 4kV, 1.2/50 µs for differential mode
Induced (Conducted) RFI	IEC 61000-4-6: 2004 - 0.15 - 80 MHz : 10 Vrms 1 kHz, 80%AM for DC power, serial and Ethernet port

Power Frequency Magnetic Field	IEC 61000-4-8: 2001 -40 A/m & 1000 A/m
Damped Oscillatory Magnetic fields immunity test	IEC 61000-4-10 T rise: 75 ±- 20% Oscillation frequency 1MHz: ±- 10% Repetition rate: 400 /s for 1 MHz ± 10%, Burst duration: Not less than 2s Continuous magnetic field strength: 30 A/m
Voltage AC Dips & Interruption	IEC 61000-4-11 - AC Power port 0% short Interruption for 250 cycles, 0% of AC mains voltage for 0.5 cycles and 1 cycle, 40% dips for 10 cycles, 70% dips for 25 cycles, 80% dips for 250 cycles
Damped Oscillatory Wave	IEC 61000-4-12 Damped Oscillatory Frequency: 1 MHz Common Mode: up to ± 2.5 kV Differential Mode: up to ±1.0 kV for power port 1 MHz Common Mode: up to ± 2.5 kV for serial port 1 MHz Common Mode: up to ± 2.5 kV for Ethernet port
Immunity to Conducted Common mode disturbances	IEC 61000-4-16 Ed 1.1 frequency range 0-150kHz
Ripple on DC power line immunity test	IEC 61000-4-17 10% of the Nominal DC voltage AC line frequency 50Hz on DC power port
Voltage Dips & Interrupts	IEC 61000-4-29: 2000 - 0% short interruption for 0.03 sec, 40% and 70% dips for 0.3 sec, 80% & 120% variation for 3 sec
Impulse voltage Immunity	IEC60255-5 2000-12, Ed2.0 ±5kV for power port and earth
Barometric Pressure test	IEC 60870-2-2 Ed 1.0 Test range 0 (101.3 kPa) to 3000m (70.0 kPa)
AC Voltage Range and Tolerance test	IEC 60870-2-1 Ed 2.0 176 Vac (-20 %) to 253 Vac (+15%)
Cold Temperature test	IEC60870-2-2 tested at -40 oC
Hot temperature test	IEC60870-2-2 tested at 70 oC
Humidity test	IEC60870-2-2 95% RH 55oC and 55oC
Vibration and Shock test	As per IECC60870-2-2, Class Am, 5Hz to 500Hz on X,Y, Z axis, 10g in X,Y, Z axis
Green Product	RoHS

Central Data Collection System (CDCS)

A central data collection system (CDCS) shall be provided at SLDC for collection and processing of data from DCUs installed at remote locations. CDCS shall perform following functions: -

Communication with DCUs Collection of energy data from DCUs Collection of status data form DCUs Remote Configuration of DCUs GPS clock signal to DCU Processing of energy data.

Storing of data.

Providing data to energy accounting software. Reporting functions.

Monitoring and Alarming. Audit trail and logging. Meter management.

Shall have user Interface for Data/Report uploading on website.

Data/Report access for predefine list of meters to SLDCs with secure user name and password for intrastate energy accounting.

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In case of AMR communication system failure due to any reasons manual provision should be made for uploading IEM data to the MDP software for energy calculation.

CDCS shall include a web-based application for utilities/stations to manually upload the data in case of AMR communication system failure due to any reasons. The following shall be taken care of in this regard:

The web application link shall be made accessible to all stations through SLDC website. The downloaded data shall be in encrypted format.

Each utility shall be given User name and Password for login the web application. Browser shall have the list of all Utilities and its station names.

Each station shall upload the encrypted data by selecting their Utility name and Station name.

Web Application shall generate the confirmation message to the station on successful uploading of data.

Web application shall generate the popup message at CDCS with Utility name and Station name on receipt of data. All the encrypted data received at CDCS via web application shall be stored in predefined path.

CDCS shall have the provision to decrypt the data and store in the database for the further processing. Communication with DCUs

The CDCS shall have a dedicated Communication Server – This shall manage the VPN Connections, DCU Communication, Alarm management, Logging, DCU Configurations as well as GPS clock signal to DCU. The Interface of the Communication Server shall be standards based such that, up gradation of either Communication System or Application Server will not need a commensurate replacement f the other. The CDCS shall have a Network Management Interface that provides a Dash Board of the DCU's and their status / Alarms and Meter's that are not communicating.

Collection of energy data from DCUs

CDCS shall collect data from energy meters through DCU for selected/configured meter location periodically or on demand at any time. CDCS shall have a scheduler software, which shall issue command to the concerned DCU and collect the required energy meter data. It shall be possible to schedule data downloading on hourly basis.

Collection of status data form DCUs

CDCS shall have a DCU monitoring module. This module shall monitor each DCU for its working status, parameters and any alarm etc. The monitoring data shall be collected periodically or on demand at any time from all or selected DCUs.

Remote Configuration of DCUs

CDCS shall be provided with software module for remote configuration of selected or batch of DCUs. Remote DCU configuration module should be able to configure each parameter of DCU individually or in batch mode. It shall be possible to download the following changes to the remote device in addition to other required changes:

Poll cycle for collection of energy data.

Fixed public IP of CDCS server of the Control Centre Changes in meter protocol driver

GPS clock signal to DCU

CDCS shall send time sync signal to DCU to time synchronize the IEMs connected to that DCU. CDCS shall check the time in each meter on a pre-configured interval (say once a day) and if the drift in meter clock is more than maximum allowed drift (say 60 seconds) with reference to GPS time, the DCU shall initiate clock synchronization in incremental manner with pre-configured offset interval(say 10 seconds). Tenderers can propose alternate mechanisms with the objective keep all the meter clocks within 60 seconds drift with reference. Any meter time change command initiated by the AMR system should be logged as part of audit trail.

Processing of energy data

Collected energy meter data (5-min) shall be provided to the data processing module. The time block period of the raw output from CDCS shall be user defined (5 min). This module shall check the data for completeness, error etc. and if any error is found, the same shall be displayed as an alarm.

Storing of data

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If collected data is error free, it shall be provided to a data storage module. Data storage module shall load the collected energy data in to the database as per its structure. Archival of data shall be through RDBMS data base. CDCS shall provide online storage for storing a minimum of 10 years of collected, processed and output data.

CDCS event archive data storage historian shall provide a minimum data storage of 10 years, assuming event will not be more than 20% of the total time.

Providing data to energy accounting software

CDCS should have software module for providing energy meter data from the database to the energy accounting software. The data output shall be in the form of text file (as per IEMs standard text file format) or as query-based output. Reporting

CDCS shall have data reporting capability implemented through a separate dedicated module. Reporting module should be able to give report output on screen, in pdf or in xls/csv form. Reports may be based on pre-configured criteria or based on adhoc query.

Monitoring and Alarm

CDCS at SLDC shall provide DCU monitoring and self-monitoring functions to monitor the operating conditions and the performance of the system.

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

Any detected problems shall be reported through local display, built-in event logging and to remote console or printer. Severe problems, such as loss of communication, shall generate alarms locally and e-mail notifications to configured e- mail address. User shall be able to enable and disable alarms individually.

CDCS shall generate an alarm whenever "data not received" occurs for one or more times for one or more DCU/IEM data. The alarm shall indicate which DCU/IEM has the problem. All Alarms (such as loss of supply to IEM, DCU failure, Communication failure, AMR failure etc.) to be generated in CDCS within 5 min. of the event.

Performance levels for AMR and CDCS

Data from all the installed IEMs shall be received at CDCS within 8 hours after the scheduled hour (as per user defined).

Report for missing data if any shall be generated instantly on demand.

Issues observed in data collection, processing, report generation etc. shall be flagged by SLDC to the vendor for speedy redressal.

Audit trail and logging

CDCS should have audit and logging function for each and every activities either completed successfully or failed should be logged. The system shall provide audit trail of user and system activities that enables data changes to be tracked and reported, including changes made by the system administrator. For editing of energy meter data, the system shall record the following information in a log and store it for a minimum of 12 months:

- User ID

- Date and Time of Change

User shall be prompted to input a reason for editing using either a standard reason code or a freeform text field. In addition to data stored in the edit log, each interval containing edited data shall be marked with a status to indicate that the data has been edited. The pre-edited value shall be stored in the database as a previous version, which can be retrieved using "as-off" date functionality.

Changes to configuration data by users shall be logged by Date, time, and user ID and such logs shall be stored for a minimum of 12 months. Critical changes relating to measuring parameters (pulse multipliers, transformer ratios, etc.) and formulae change shall be stored indefinitely as a previous version. The database for these is to be maintained in CDCS. For regular system tasks, such as meter communication, task processing, validation, etc. the information will be kept for minimum one month. Full data and system audit ability such as version controls and data retrieval according to the date and time. Additionally, all versions of meter data shall be stored such that they may be retrieved by "as-off" date for user to inspect.

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Email & SMS Alerts

CDCS Application software shall have the option to send alerts and notifications via SMS and email to authorized users (operators or maintenance personnel). This shall be used to configure alerts for critical events such as communication device failure, IEM failure, DCU failure, Power supply failure, data collection error reports etc. The software should have option to email reports generated in the system as email attachments.

Data collection, Validation of Data & Reporting

The intent is to provide the requirement details of database-oriented software having capability to exchange and share data/ information with similar database systems that may be used by SLDCs with a view to meet requirements of Data Warehousing and BI systems. The client interface should be browser or console based and report formats should be in user defined multiple formats like PDF, MS Excel, CSV, Text etc.

Collection, Processing and Computation of Meter Data

While importing data from CDCS to software, any discrepancy or missing of data in any particular block or wrong raw data format shall be displayed and downloaded in the form of a report. The output format shall be station-wise, Utility wise and period wise

Software shall have the option to generate the list of meter IDs whose data is not available, List of meter IDs whose data is available for day wise for the required period.

The computation of meter data from IEMs shall be done automatically after activating the import option for data fetching from CDCS

All meter data computation (Active Energy, Reactive Energy, Voltage etc.) shall follow configured Time Blocks region wise Software shall have the provision to access and correct the IEMs raw data in database, if required. The corrected raw data shall replace the old data. It may be noted that multiplication factors are accounted in the meter itself and the practice of applying multiplication factors of CT/PT needed to be dispensed with to reduce computational effort on servers

Validation of IEM and Fictitious Meter

IEMs and fictitious meters are classified in 3 categories

- Main Meters

- Check Meters

- Standby Meters

Prior to energy accounting, validation and IEMs and fictitious meters data is essential for accurate energy accounting Validation of main meters data is done by pair-checking and that with Check and stand-by meters data by block wise (5/15 minutes)

The validation of data, software shall have a pair configuration file where all set of pairs can be defined.

Pair check file shall be user configurable for addition/ deletion/ modification of pairs in accordance with the change in network configuration

When pair check option is activated, Software shall compute the difference between the selected pairs and shall generate the output file which shall consist of actual difference and percentage of difference

Generally, the polarity of Main and Check meters is same as whereas polarity of main and stand-by meters is reverse. The software shall compute accordingly

For calculating percentage difference, the reference energy value shall be the sending energy value for Main-Standby meter (M-S set). Since polarity of main and check meters is same, the main meter energy data shall be considered as reference for pair check of Main- Check meter (M-C) Set

Sending end can be decided based on the polarity of the meter data (Sending end polarity is +ve , while receiving end polarity in –ve)

Software shall generate the pair check output file which contains block wise difference and percentage difference values of all pairs whose %age difference is greater than tolerance value)

Tolerance %age value shall be user defined and it may vary from element to element. The tolerance value shall be user give in pair check configuration file for each pair

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Data Exchange Facility for integration with SAMAST Software

The proposed AMR solution will have facility to integrate with proposed SAMAST software. The AMR Vendor needs to share data in format desired by SLDC through Application Programming Interfaces (APIs) / web service model with proposed SAMAST software.

Reports

Software shall have the feature to prepare reports (5/15/ minutes) in user defined Text, PDF, Excel and CSV format Active Energy Reports

Software shall have the capability to prepare day wise active energy reports of utilities. The report shall be prepared for each utility. The formats shall be user configurable

Voltage Reports

Software shall have the option for preparation of voltage reports (5/ 15 minutes) for required meters. The files should be user configurable

The format for 5/ 15 minutes block wise Voltage reports should be same as that of active energy reports

Software shall have the option for preparation of low voltage logging reports (5/ 15 minutes) (as per user defined limits) Software shall fetch the details of the meter ID which have recorded low voltage.

Frequency Report

Frequency data of reference IEM shall be used for DSM accounting. If main reference meter data is not available, first standby meter data frequency data shall be used for accounting. If both main and first stand by meters data are not available for a particular period, second stand by meter frequency data should be used for these periods. The software shall have a user frequency configuration file for selection of any of the reference IEMs.

The finalized frequency by as per user of SLDC to be exported to proposed SAMAST software and Website and others as per SLDC requirements.

S/W shall have the module to compare the frequency data recorded by all IEMs with reference IEM frequency data and to generate the report/trend for any required period (Date and Time through query. The module shall also have the option to define frequency tolerance value. If difference in the frequency data is greater than the tolerance then report shall show the same.

Issues to be addressed during Data Validation

As the input raw data is in 5-min blocks all computations in new data processing software shall be done in 5-min only While Reports generation, Data Processing Software shall provide two options two generate processed data reports in 15/5-min depending upon the user requirement.

The format of the 15-min processed data reports shall be exactly same as that of the existing 15--min processed data reports in text tiles

Graphs/ Trends

Software shall have the option to display the graphs/ trends in user defined standard chart type such as line, scatter plot, bar chart etc. of different electrical quantities (energy, voltage, frequency etc.) already stored in database for the required period (date and time) through query.

There shall be provision to download the graphs/ trends in required formats (JPEG, PDF etc.) The X and Y axis parameters of the graphs are user definable

Data Exchange

The solution will have facility to integrate with proposed SAMAST software. The AMR Vendor needs to share data in format desired by SLDC through Application Programming Interfaces (APIs) / web service model with proposed SAMAST software.

GPS CLOCK

The GPS clock will be installed at each SLDC. The GPS clock must have the intelligence to synchronize with NAVIC signal/ NTP/SNTP output.

The Time synchronization equipment to be installed on one of the existing panel at site, shall receive the Coordinated Universal Time (UTC) transmitted through Geo Positioning Satellite System (GPS) and synchronizes equipment to the Indian standard time in a SLDC. Equipment shall have real time digital display in Hour, Minutes and Seconds (24 Hours mode). Standard will be relevant IEC & IS (15959) in line with this document.

Time synchronization equipment shall include antenna, all special cables and processing equipment etc. The length of the Cable for antenna shall generally be Max. 30 Mtrs. However depending on the special requirement, additional length of cable shall be supplied wherever required, without any extra cost

It shall be compatible for synchronization of CDCS.

Equipment shall be able to operate up to the ambient temperature of 50 degree centigrade and 95% humidity.

The synchronization equipment (TSE) shall have 2 microsecond accuracy equipment shall able to meet real time corresponding to IST (taking in to consideration all factors like voltage & temperature variation, propagation & processing delay etc)

Equipment shall meet the requirement of IEC 60255 for storage & operation

The system shall be able to track the satellites to ensure no interruption of synchronization signal.

The output signal from each port shall be programmable at site for either one hour, half hour, minute or second pulse as per requirement.

The equipment offered shall have Minimum seven (7) output ports. Combination of output ports shall be following: - Potential free contact (Minimum pulse duration of 50 milli seconds): 01 No.

IRIG-B: 02 Nos.

RS232C: 01 Nos.

SNTP port: 02 No.

Unmodulated/modulated : 02 Ethernet

The equipment shall have a periodic time correction facility of one second periodically.

Time synchronization equipment shall be suitable to operate from 220V DC (or) 110V DC as available at Substation.

GENERAL: Tenderer has to supply the suitable connectors of all seven Outputs of the TSE. In case of IRIG-B, T type connectors will be supplied for Looping.

General Requirements

Components of AMR system shall meet following requirements:

Data Concentrator Unit (DCU)

DCU shall be a self-contained, stand-alone, tamper proof sealed box with necessary ports for external connection. It shall be flush mounted or surface mounted without requirement of a separate panel

DCU should be of reputed make and should be field tested in similar application for central govt /state govt./PSU etc. DRS/data sheet approval will be taken by drawing during drawing approval stage

All components inside DCU shall be easily accessible for testing. The plug-in units, whose removal or insertion, when in operation might endanger the reliability or performance of the unit, shall have suitable protection

Each sub-assembly inside DCU shall be clearly marked to show its function, schematic reference so that they are identifiable from the component layout diagram in the handbook

All external connections to DCU should be secure so as to avoid accidental disconnection.

The DCU shall be powered from the station battery backup supply rated at 110 V/220V DC supply or UPS supply DCU shall have protection against entry of dust, lizards, Rats etc.

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Substantial EMI (Electro Magnetic Interference) and ESD (Electro Static Discharge) will be present at DCU site, effect of which shall be duly considered while designing the system. Performance of the overall system shall not be hampered by such interferences. EMI / ESD tolerance shall comply with IEC 61850-3 standard.

DCU shall be able to operate in environment with temperature up to 50ºC and humidity up to 95% without any significant effect on its performance.

The mechanical design and construction of each unit sub-assembly shall be inherently robust and rigid under various conditions of operation, adjustment, replacement, storage and transport

DCUs shall also withstand, without any damage or mal-operation, reasonable mechanical shocks, earthquake forces, ambient temperature variations, relative humidity etc. They shall have an IP-51 category dust-tight construction and shall

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be capable of satisfactory operation in an indoor, non-air-conditioned installation.

A local display for status like power on, communication activity etc. and alarms like power failure communication fault etc. shall be provided on the face of DCU

A web-based display of DCU dashboard displaying all status; logs of activities, logs of alarm etc. shall be provided which shall be accessible from local PC as well as on CDCS

All communication between DCUs and CDCS should be end to end encrypted through secured Virtual Private Network (VPN) tunnel which shall be transparently managed between each DCU and the CDCS by the M2M Gateway/communication Server

Transfer of data from DCU to CDCS should be on TCP/IP over Fibre optic communication or using GPRS.While using GPRS the communication between DCU and the communication server/M2M Gateway should be on dynamic/virtual IP so that the communication is operator independent for all DCU's communicating simultaneously with different service provider- based SIM cards

For communication with CDCS, each DCU should be provided with Ethernet port, Serial port option for integration with existing Fibre Optics communication media. If any media converter is required for the integration, Tenderer has to supply the same. This is needed even for substation that presently does not have FO communication since FO communication is likely to be added in the future. For locations that do not presently have FO communication, built-in GPRS modem of DCU /external modem must be capable of transferring the data to CDCS

For GPRS Mode of communication the DCU should have provision for two SIMs from two different service providers (best available internet service provider of that particular site) with provision of fall back between the two SIM's in case of failure of communication with one SIM

For Substations where FO communication /PSTN is implemented, the GPRS mode of communication should be capable to be configured as back up communication mode

All modem/SIM installed shall be securely and firmly mounted on DCU itself Mounting or un-mounting of modem/SIM shall be accessible from front of DCU It shall be possible to change modem/SIM without uninstalling DCU

Mounting of modem/SIM shall be sealable

The Modem shall meet the following environmental specifications, IP55 housing, Storage Temperature: -20 degrees to

+70 degree Celsius, Operating Temperature: - 10 degrees to +60 degree Celsius, Humidity: - 95% RH (Non - Condensing)

Item	Description
PORTS:	15 Ethernet Port* (for Meter interface),1 RS 485 PORT,1 SERIAL PORT, 2-4 USB, 1 or 2 GPS Clock synchronous port. *Suitable network switch to be considered for interface between meters and DCU in case of Ethernet communication.
SUPPLY:	Station battery backup supply rated at 110V/220V DC supply or UPS supply.
SIM:	DUAL SIM, INBUILT GPRS MODEM

STORAGE:	ATLEAST 15 DAYS OF DATA
OPERATING TEMP:	-10 degrees to +60 degree Celsius:
HUMIDITY:	- 95% RH (Non - Condensing)
DUST PROTECTION	IP-51 CATEGORY
COMM.PROTOCOL	TCP/IP while OPGW / GPRS
Max Meters/DCU	15
COMPATIBLITY	DLMS/COSEM STANDARD
COMMUNICATION REQUIREMENT	Should be able to communicate with at least 2 IPs.
Earthing	The DCU, Communication terminal equipment's, HUB and all associated equipment's of AMR at site to be properly grounded at two places through suitable copper strip/bundled wire. The earthing strip will be connected to existing grid strip/flat/ and healthiness of earthiness & any additional requirement (viz. Spike V guard etc.) will be full-filled by Tenderer as required telecom/metering/communication equipment as supplied & installed by Tenderer

Notwithstanding the above, the MODEM should meet the following specifications:

Standard and Convenience

Dual SIM, Dual Module and ACTIVE/ACTIVE mode supported

Support standard RS232 (or RS485/RS422), Ethernet & WiFi port that can connect to Serial, Ethernet & WiFi devices directly.

Support standard WAN port & PPPoE protocol that can connect to ADSL directly Enter into communication state automatically when powered

Support several work modes

Convenient configuration and maintenance interface WEB or CLI

Features

Support Master module, Standby module and WAN (PPPOE, ADSL) Optional triple link backup

Support 2G/3G/4G/Static IP/DHCP/L2TP, PPTP, PPoE WAN access methods Support VPN client (PPTP, L2TP, OPENVPN, IPSEC and GRE)

Support VPN server (PPTP, L2TP, OPENVPN, IPSEC and GRE)

Support local and remote firmware upgrade, import and export configure file. Support VLAN, MAC Address clone, PPPoE Server

Support WiFi 802.11 b/g/n, AP Client, Adhoc, Repeater Bridge mode WiFi support WEP, WPA, WPA2 encryption and MAC address filter Support multi trigger ways, SMS, ring and data

Support link disconnection when timeout Support APN/VPDN

Support DHCP server and client, Firewall, NAT, DMZ host, URL block, QoS, Traffic statistics, Real time link speed statistics etc.

Full protocol support, TCP/IP, UDP, ICMP, HTTP. Optional SMTP, POP3, OICQ, TELNET, FTP, SNMP, SSHD etc.

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Cellular Specification

Cellular Module: Industrial Cellular module Standard and Band:

Main & Standby Module

LTE FDD 2600/2100/1800/900/800MHz, (Band 1/3/7/8/20)

700/1700/2100MHz (Band 2/4/5/13/17/25 optional)

LTE TDD 2600/1900/2300MHz (Band 38/39/40). 800 / 1400 / 1800

MHz. Band27/61/62 Optional

DC-HSPA+/HSPA+/HSDPA/HSUPA/WCDMA /UMTS 2100 / 1900 / 900

/ 850 / 800 MHz (Band 1, 2, 5, 6, 8) EDGE/GPRS/GSM 900/1800/1900MHz

Bandwidth FDD LTE: DL: 100Mbps, UL: 50Mbps TDD LTE: DL: 61Mbps, UL: 18Mbps

TX power: <24 dBm

RX sensitivity: < -109 dBm

System Availability Requirements

AMR system, subsystems and system components shall be able to meet the following availability requirements. The CDCS software shall have a measured availability of 99.99 % or better during the availability test.

The CDCS software shall continue to operate without interruption under any single point of failure condition. That is, there shall be no hardware or software element whose failure renders the CDCS unavailable. This requirement shall specifically include all AMR system components like hardware, the interconnections among hardware, power supplies, and all enclosures.

Field Wiring: The Tenderer has to provide the following:

Wire: Single core, 2.5 sq. mm, multistrand copper wire along with items like "U" lugs(copper), sleeves, ferrules, necessary terminal blocks etc for PT wiring.

Wire: Single core, 2.5 sq. mm, multistrand copper wire along with items like "Ring" lugs(copper), sleeves, ferrules, necessary terminal blocks etc for CT wiring.

Uninterrupted Power Supply and cable for Meters.

All required items not specifically mentioned but required for successful commissioning of the project.

Laptop Spec: The laptop with OS & Meter reading software shall have at least specifications as mentioned in Annexure-M-I:

System Sizing and Performance Requirements

AMR System shall meet the following system sizing and performance requirements. The system sizing and performance requirements are specified for main subsystem. Standby subsystem shall have the same sizing and performance requirements. The Acceptance of the product shall be based on the Owner/SLDC approved test protocols/ schedules to be submitted in advance by the Tenderer ahead of factory/site inspection. The system sizing for AMR System is only specified for initial sizing. The delivered system shall be expandable as the input and output requirements grow. Vendor is required to demonstrate their system's expandability in FAT.

CDCS shall be capable to receive data from a minimum 400 DCUs, which is collecting up to 15 energy meters connected per DCU, at the minimum data collection interval. However, CDCS shall have provision to collect and handle data from up to 1000 DCUs and up to 5000 energy meters without any significant degradation of performance.

GENERAL CONDITION: The Tenderer stands responsible for end to end integration from meter output to CDCS. Field Survey for Availability of GPRS-2G 3G/4G data networks may be made by the Tenderer prior to submission of TENDERs.

DRS approval- Data sheet approval (of all items to be supplied, BOQ-item or Non-BOQ item as required to be supplied under project- Refer Note-4 Annex-L, Annex-M-II) along with scheme drawing approval will be proposed by executing agency at the scheme/design engineering stage and will be approved by the utility.

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Location wise as built drawing (showing what are items supplied/connected /installed in one location, wiring schedule if any) will be provided by Tenderer after commissioning.

A SAT/Commissioning format (for all items) will be proposed based on the scheme as finalized and same will be followed SYSTEM

Network Communication

Users and MDAS applications shall be able to communicate within the ABT system local area network (please refer to the tender "Supply, Installation, Testing and Commissioning of IT Solutions as a part of Scheduling, Accounting, Metering and Settlement of Transactions System at SLDCs in the North Eastern States")and operate as described in this Specification. The network communications software shall use a standard network protocol such as TCP/IP. The software shall link dissimilar hardware nodes such as workstations, servers, and peripheral devices into a common data communication network allowing communications among these devices.

Remote Diagnostic

Remote Diagnostic facility with necessary Hardware as required shall be provided for communication between the CDCS system at control center, DCU at Sub-station and the utility's support office for the diagnosis of Hardware & Software problems. The login shall be protected by a user name & password entry. This facility through separate port shall also be extended to the Owner through a separate secure port for remote maintenance.

Network services

The following network services shall be provided for the users of CDCS system within the LAN(please refer to the tender "Supply, Installation, Testing and Commissioning of IT Solutions as a part of Scheduling, Accounting, Metering and Settlement of Transactions System at SLDCs in the North Eastern States"):

(a) File management and transfer of files containing text, data, and graphics information.

(b) Printing management

(c) Backup over LAN

(d) Task-to-task communications to external computers

(e) Remote procedure call

(f) Remote terminal session

System Security& Cyber Security

The Contractor shall document and implement a Cyber Security Policy in line with CERT-In latest guidelines(http://www.cert-in.org.in) to secure the system and the Contractor shall keep updating the Security settings as per the revised guidelines of CERT-In at time to time. Below listed basic strategies shall be followed by the Contractor for making the entire Control Centre immune to Cyber-attacks.

All the Hardware, OS and application software shall be hardened.

Network partition and DMZ through use of Firewall as required maximizing the security of ABT, OA AND MIS System while facilitating access for data and information to all stake holders.

All default user id & passwords shall be changed.

All log in/log out and cable plug in/plug out shall also be logged in the System.

Prevent unauthorized users from reading or writing data or files, executing programs or performing operations without appropriate privileges

Document all user sign on procedure

Record all network traffic for detecting unauthorized activity, unusual activity and attempts to defeat system security (Contractor to propose and document what constitutes normal activity/traffic)

Vendor has to identify and list the entire network and other protocols that communicate with physical systems and limit what is not required.

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Network Zoning shall be implemented as per the proposed architecture given in Fig.1. However, the Contractor may suggest other methods of network architecture without compromising the security of the System.

No user shall be allowed to access remote network zones other than the adjacent zone.

Latest Cyber Security Guidelines of CERT-In specified at (http://www.cert-in.org.in) shall be followed. In normal condition all USB ports of all servers/work stations shall be disabled

Database Management

The database manager shall locate order, retrieve, update, insert, and delete data to ensure database integrity and have provision for backup and recovery of database files. The database manager shall generate and modify all meter data by interfacing with all database structures. In systems with a distributed database, the database manager shall have access to all portions of the database wherever stored. The location of database items shall be transparent to the user performing database maintenance.

All newly defined database pages, elements or data shall be initially presented to the user with default values for all parameters and characteristics where defaults are meaningful. The user shall be guided to enter new data, confirm existing data, and change default values as desired.

All required entries for any database item selected for changes shall be presented to the user. When parameters are entered that require other parameters to be specified, the additional queries, prompts, and display areas required to define the additional parameters shall be presented automatically.

The database manager shall include the mechanisms, in both interactive and batch processing modes, to perform the following functions:

(a) Add, modify, and delete database items.

(b) Add, modify, and delete application program data

(c) Create a new database attribute or new database object

(d) Resize the entire database or a subset of the database

(e) Redefine the structure of any portion of the database.

Database development tools

The Contractor shall provide all necessary software tools for the development and maintenance of the databases at Control Centre. This tool shall be capable of managing the entire system database. The database development software tool delivered with the CDCS/MDAS system shall be used to generate, integrate and test the database. The database development tool shall facilitate IEC 61970 CIM data exchange of both incremental and full power system model.

This tool shall contain database structure (format) definitions and all initialization data to support the generation of all relational and non-relational run-time databases required to implement the system's CDCS/MDAS functions. The tool shall include consistent, coordinated procedures to manage and access the databases. Extensive reasonability, integrity, and referential integrity checks shall be made on user entries to detect errors at the time of entry. Invalid entries, such as entering an invalid data type or attempting to define contradictory characteristics for a database item, shall be detected and reported to the user in an error message. Help displays shall be available to provide additional, detailed information to the user on request.

Tracking Database Changes

The database manager utility shall maintain Audit trail files for all changes made by all users. The audit trails shall identify each change including date and time stamp for each change, and identify the user making the change. An audit trail of last one-year operations shall be maintained.

Cyber Security

he entire system shall be subjected to cyber security audit every year by CERT-IN certified agencies. The Tenderer shall arrange for cyber security audit.

Reporting System

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Data Extraction – The incremental Data is to be extracted from the various data sources including web-forms, data files and loaded into the master data store. The extractors to the source and target data sources must be provided as part of the application. It must be feasible to schedule the data extraction activities and perform them on ad hoc basis and pre- defined trigger. The Solution must be able to check for availability of data to be extracted and present the status on a dashboard

Data Validation - Relevant rules are to be defined on the extracted data to validate the reasonability of the information. These include rules for checking the value range, sign, and null values. The solution must enable to define business rules

/ validation rules on a data element level. It must also list/highlight pending data inputs for completion of a process.

Data Store - The validated data shall be loaded into a data store using an appropriate tool. The data to be loaded must be transformed, cleansed, and standardized before loading into the data store. The business rules defined by successful Tenderer shall be validated by the utility. The database shall eventually be hosted on the Storage Area Network (SAN) (please refer to the tender "Supply, Installation, Testing and Commissioning of IT Solutions as a part of Scheduling, Accounting, Metering and Settlement of Transactions System at SLDCs in the North Eastern States")for scalability and ease of archival. The application must be able to interface with SAN. Tools for DB archival, truncation etc. to be provided as part of the Application

Reporting - The data in the data store shall be used to generate reports that involve arithmetical and statistical operations on the data to arrive at calculated values. The reports to be generated include the current set of reports. Report generation in multiple file formats like XLS, PDF etc. must be supported. The solution must enable drill down, drill across and roll-up for data elements Design and publish new reports on a need-based basis. Create dashboards, charts & reports

User Friendly Graphical user Interface (GUI) for editing report formats, layout field's etc. facility to augment an existing

report with copy-create options to incorporate changes from time to time.

- The different types of reports to be generated are

- Regular reports on trigger after all data is uploaded

- Custom report

- Freeform nullified query interface (User shall be able to select fields/parameters dynamically and generate the report)

The GUI for making new reports and custom reports must be use friendly with DB field appearing on a pane which could be dragged and dropped at a relevant location on the report. The solution shall also provide a web form for entry of data for creating a log book type report at the end of every shift, outlining brief details of events during the shift-outages in shift, LCs availed etc. the reporting solution shall also be required to output data in csv, xls(x) format for aiding in preparation of weekly, monthly and yearly report. These reports are available in SLDC websites.

Configurability - The reporting requirements are dynamic and new reporting needs arise from time to time. The underlying data for the reports shall still be available in the system but the system shall be configurable to generate administrator defined reports and publish them. The solution shall be future ready to accept newer sources of data through ODBC, XML, CSV, TXT and generate fresh reports applying of varying periodicity.

Dashboards - The reporting needs include generation of reports in easy to use and intuitive graphical format allowing the selection of widgets, chart types, flash objects and features such as tool tips. Data querying shall be enable for all authenticated users from SLDC to the master database at RLDC/NLDC as part of custom report or free from query.

Data Replication - The Schema of the data store at each of the SLDC needs to be replicated at RLDC/NLDCs on real time basis. At the RLDC a separate set of reports need to be published aggregating the data of all the SLDC's own data Suitable solution architecture is also shown below for the application and data base server deployment

Administration - Separate groups of users shall be created to access the systems like System Administrator, SLDC Administrator, SLDC Member, User Member, Public. Different user categories and their functionalities to be decided by respective SLDCs.

Notifications - The solution must support notifications through SMS and e-mail. SMS and email gateways/ API (SMS) shall be provided by SLDC. Notifications to the relevant users upon submission, updating and non-submission of data (beyond threshold time) shall be some of the applicable scenarios.

Solution Access - The Solution must be accessible securely both from within the SLDC Intranet and the Internet. All forms, page for upload of data etc. exposed to Internet for constituents /ISGS data entry has to be password protected.

General Requirement:

Software's shall be Web based application developed in open-source technology; all the additional plugin / server software licensing cost shall be included in scope and taken care by the Tenderer.

The software shall have role base access.

The software shall have authentication and authorization with single sign–on.

The integrated operation software shall be user friendly, scalable etc. Some of the features of the application are as:

- All logs should be highlighted with a notification.

- Pointer duplicacy should be avoided while making data base.

- Uniformity/Standard should be maintained for all data base. Nomenclature/ Aliases should be decided by the supplier and SLDC/utility.

- Common front end for all the modules

- Integration of all the modules with each other

- Integration of any other related third party application in the common front end.

- Upgrading the modules as per extant and amended regulations of CERC/SERC.

- Output of all these modules should be configured with the other modules of SAMAST.

- The software shall be designed in extensible manner so that it can accommodate future changes and could be easily maintained.

- The software shall have facility to add/block/edit users having different levels of rights and authorizations.

- The software design shall take care of system performance tuning & other configuration details as may be required.

- The software shall prompt alerts and /or confirmation before any major changes like marking for deletion, updating etc.

- Software shall have usual GUI and operating aids like Troubleshooting Tips, Keyboard Shortcuts, Tool Tips, Menu and Toolbar, that are not conflicting with the end user browser settings.

- The software shall have compatibility with industry standard internet browsers such as Microsoft Internet Explorer, Mozilla Firefox and Google Chrome etc.

- There shall be facility for import / export of data through Excel sheet / Open office spread sheet/csv files.

- Option for exporting reports to PDF and excel / csv formats.

- Suitable scheduling of back-up (application and database) through the application/automatically as per the requirement of data security.

- The developed software shall have the facility to register requirement/ modification and bugs reported by various users during operation.

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- The system developed shall have facility of help by way of FAQs and User Documentation to the users of the system.

- The software shall have provision for sending auto-generated e-mails/SMS, as identified by the system administrator.

- The software shall maintain the version details and changes carried out in respective version. These details shall be available to all users.

Audit: The system shall provide defined audit trail of various activities performed by the users as required.

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4.2.0   TECHNICAL SPECIFICATION FOR CONTROL AND RELAY PANELS (WITH AUTOMATION)

4.2.1   SCOPE

4.2.1.1   This Section is intended to cover the design, manufacture, assembly, testing at manufacturer's works of Indoor Relay and Control Panels.

4.2.1.2   The Control and Relay Panels required are for control and protection of the Power Transformers, Feeders and for others according to requirements. The supply shall include all accessories, special tools, relevant software, supporting steels, spare parts, drawings, instruction manuals etc. The panels shall be supplied complete with all accessories as specified and completely assembled and all internal wiring completed.

4.2.1.3   The sub-stations will have automation as per guidelines of IEC 61850. The contractor has to supply the C&R panels to match the requirement of existing Sub-station Automation System (SAS).

4.2.2   STANDARDS

4.2.2.1   All equipment and all component parts supplied under this specification shall conform in all respects to the latest issue of relevant Indian Standard Specifications except where specified otherwise in this specification. Equipment meeting any other authoritative standards which ensure an equal or better quality may also be acceptable.

4.2.3   TYPE OF PANEL

4.2.3.1   All panels shall be simplex type. One simplex panel shall be used for each feeder and bus coupler / by pass breaker. For transformer bays two simplex panels (one each for HV and LV sides) may be used if required.

4.2.3.2   Simplex Control and Relay Panels shall consist of vertical swing front panels with equipment mounted thereon and having front glass door. Each cubicle assembly shall be provided with doors on the rear having handles with built in locking facility. It shall have double leaf doors with lift off hinges at the back for panels of width more than 800 mm.

4.2.4   CONSTRUCTIONAL FEATURES

4.2.4.1   The panels shall be completely metal enclosed to ensure a dust, moisture and vermin proof atmosphere. The enclosure shall provide a degree of protection not less than IP 54 in accordance with IS-2147

4.2.4.2   Panels shall be rigid free standing and floor mounting type and comprise of structural frames enclosed completely with specially selected texture finished, cold rolled sheet steel of thickness not less than 3mm for weight bearing members of the panels such as base frame, front sheet and door frames and not less than 2.0 mm for sides, door top and bottom portions. There shall be sufficient reinforcement to provide level surfaces, resistance to vibration and rigidity during transportation and installation.

4.2.4.3   All joints shall be made flush and all edges shall be bent at right angles and rounded. All structural members shall be bolted or welded together. Necessary arrangement shall be provided for bolting together the adjacent panels as well as for fastening them to the floor. The opening required for mounting the equipment shall be punched or cut and filed smooth.

4.2.4.4   All doors, removable covers and panels shall be sealed all around with synthetic rubber gaskets Neoprene/EPDM generally conforming to provision of IS 11149. However, XLPE gaskets can also be used for fixing protective toughened glass doors. Ventilating louvers, if provided shall have screens and filters. The screens shall be made of either brass or GI wire mesh.

4.2.4.5   Panels shall have additional rolled channel plinth at the bottom with smooth bearing surface. The panels shall be fixed on the embedded foundation channels with intervening layers of anti-vibration strips made of shock absorbing materials which shall be supplied by the contractor.

4.3.5   MOUNTING OF EQUIPMENTS

4.3.5.1   All equipment on and in the panels shall be mounted and completely wired to the terminal blocks ready for external connection. All equipment on the front panels shall be mounted flush. Terminal markings shall be clearly visible.

4.3.6   INTERNAL WIRING

4.3.6.1   Panels shall be supplied completely with interconnecting wiring provided between all electrical devices mounted and wired in the panels and between the devices and terminal blocks for the devices to be connected to equipment outside the panels. When panels are located adjacent to each other all inter panel wiring and connections between the panels shall be furnished and wiring shall be carried out internally. These adjacent inter panel wiring shall be clearly indicated in the drawing furnished by the CONTRACTOR.

4.3.6.2   Wiring shall be carried out with 1100-Volt grade, single core, stranded copper conductor wires with XLPE insulation. The minimum size of stranded copper conductor used for internal wiring shall be as follows:
   a) All circuits except instrument transformers circuits: 1.5 sq. mm. per lead.
   b) Instrument transformers circuit: 2.5 sq. mm. per lead.

4.3.6.3   Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided near the top of the panel running throughout the entire length of the panels.

4.3.6.4   Wire terminals shall be made with solder less clamping type of tinned copper lugs, which firmly grip the conductor and insulation.

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Insulated sleeves shall be provided at all the wire terminations. Engraved core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wires and shall not fall off when the wire is disconnected from blocks.

4.3.6.5 Interconnections to adjacent panels shall be brought out to a separate set of terminals blocks located near the slots or holes meant for taking the interconnecting wires. Arrangement shall permit easy inter connection to adjacent panels at site and wires for this purpose shall be provided by the CONTRACTOR looped and bunched properly inside the panel.

4.3.6.6 A laminated copy of total schematics is to be fixed on the inside of door.

4.3.7   TERMINAL BLOCKS

4.3.7.1 All internal wiring to be connected to the external equipment shall terminate on terminal blocks, preferably vertically mounted on the side of each panel. Terminal blocks shall be of 1100 volts grade and have 10 amps continuous rating, moulded piece, complete with insulated barriers, stud type terminals, washers, nuts and lock nuts. Terminal block designs include a white fibre-marking strip with clear plastic/silicon chip on terminal covers. Marking on the terminal strips shall correspond to block and terminal number on the wiring diagram.

4.3.7.2 Terminal blocks for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. Current transformer secondary leads shall also be provided with short circuiting and earthing facilities**.**

4.3.7.3 At least 20% spare terminals shall be provided on each panel and these terminals shall be uniformly distributed on all terminal blocks.

4.3.7.4 There shall be a minimum clearance of 250 mm between first row of terminal blocks and associated cable gland plates. Also, the clearance between two rows of terminal blocks shall be a minimum of 150mm. A steel strip shall be connected between adjacent terminal block rows at 450-mm intervals for support of incoming cables.

4.3.8   PAINTING

4.3.8.1 All Sheet steelwork shall be phosphated in accordance with IS 6005.

4.3.8.2 Oil grease, dirt and warp shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

4.3.8.3 After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of 2(two) coats of ready mixed, stoving type zinc chromate primer. The first coat may be 'flash dried' while the second shall be stoved

4.3.8.4 After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after completion of tests. Exterior Paint shall be texture finishing with RAL 7032 paint shade.

4.3.8.5 Each coat of primer and finishing paint shall be of a slightly different shade to enable inspection of the painting. The inside of the panels shall be glossy white.

4.3.8.7 A small quantity of finishing shall be supplied minor touching up required at site after installation.

4.3.9   NAME PLATES AND MARKINGS

4.3.9.1 All equipment mounted on front and rear side as well as equipment mounted inside the panel shall be provided with individual nameplates with equipment designation engraved. Also, on the top of the each panel on front as well as rear side large and bold name plates shall be provided for circuit /feeder designation.

4.3.9.2 All front mounted equipment shall be also provided at the rear with individual name plates engraved with Tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring. The nameplates shall be mounted directly by the side of the respective equipment and shall not be hidden by the equipment wiring.

4.3.9.3 Nameplates shall be made of non-rusting metal or 3 ply lamicord. Nameplates shall be black with white engraved lettering.

4.3.10   MISCELLANEOUS ACCESSORIES

4.3.10.1 8A 240 Volts, single-phase plug points shall be provided in the interior of each cubicle with ON-OFF switch for connection of headlamp.

4.3.10.2 Each panel shall be provided with a LED lighting fixtures for the interior illumination of the panel complete with all fittings, i.e. lamp, switch (controlled by panel door).

4.3.10.3 Each control panel shall be provided with necessary arrangements for receiving, distributing, isolating and fusing of D.C. and A.C. supplies of various control, AC-DC super vision, signaling, lighting and space heater circuits. MCBs of requisite capacity with fail indicators shall be used, HRC fuse is not acceptable. The main input A.C. and D.C. circuits will be protected with miniature circuit breakers.

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4.3.11   EARTHING:

4.3.11.1   All panels shall be equipped with an earth bus securely fixed along with inside base of the panels. The materials and the sizes of the bus bar shall be at least 25X4 mm copper. When several panels are mounted joining each other, the earth bus shall be made continuous and necessary connectors and clamps for this purpose shall be included in the scope of supply. Provisions shall be made for extending the earth bus bar to future adjoining panels on either side.

4.3.11.2   All metallic cases of equipment shall be connected to the earth bus by independent copper wires of size not less than 2.5 sq. mm. Earthing wire shall be connected on terminals with suitable clamp connectors and soldering shall not be permitted.

4.3.11.3   PT and CT secondary neutrals or common lead shall be earthed at one place only at the terminal blocks, where they enter the panels.

4.3.12   RELAYS

4.3.12.1   All relays shall conform to the requirements of IS 3231/IEC 60255/ IEC 61000 or other relevant Standards.

4.3.12.2   All protective relays shall be numerical type and communication protocol shall be IEC 61850 alongwith PRP compliant. Further, test levels of EMI as indicated IEC 61850 shall be applicable to these relays.

4.3.12.3   Two sets of relevant software for relay configuration & setting, maintenance etc to be supplied to each station. The numeric relay and software shall be upgradable.

4.3.12.4   Relays shall be suitable for flush mounting with connectors from rear.

4.3.12.5   All draw out cases or plug in type modular cases will have proper testing facilities. The testing facilities provided on the relays shall be specifically stated in the bid. Necessary test plug shall be in the contractor's scope of supply and shall be supplied loose. Unless otherwise specified all auxiliary relays and timers shall be supplied either in non-draw out cases or plug in type modular cases.

4.3.12.6   All A.C. relays shall be suitable for operation at 50 Hz. A.C. Voltage operated relays shall be suitable for110 volts VT secondary. DC auxiliary relays and timers shall be designed for 110 volts/ 220 volts DC and shall operate satisfactorily between 70% and 110% of rated voltage.

4.3.12.7   All Protective relays, auxiliary relays and timers except the lockout relays and interlocking relays shall be provided with self-reset type contacts. All protective relays, trip relays and timers shall be provided with electrically reset positive action operation indicators provided with proper inscription. Similar separate operating indicators (auxiliary relays) shall also be provided in the trip circuits of protections located outside the board such as Buchholz relays, temperature protection etc.

4.3.12.8   No control relays that shall trip the circuit breaker when the relays are de-energized shall be employed in the circuits.

4.3.12.9   All relays shall withstand a test voltage of 2.5 kV, 50 Hz r.m.s. voltage for one second.

4.3.12.10 All protective relays and alarm relays shall be provided with two extra isolated pair of contacts wired terminals exclusively for Employer's use.

4.3.13   GENERAL SPECIFICATION OF NUMERICAL RELAYS

4.3.13.1   **Numerical Relays** shall be provided for the following **applications** :
- Distance Protection (Main I & Main II) of different make for 220 kV lines Distance Protection for 132 kV and 66 kV Lines

- Back up directional over current and earth fault relays for 132 kV and 66 kV Lines

- Backup non directional over current (3 O/C) and earth fault relays for 33kV lines Integrated Numerical Protection

- Back up non directional over current (3 O/C) and earth fault relays with high set units for power & auto transformers.

4.3.13.2   All **Numerical Relays** should have following **minimum features** :
- Relays shall be communicable on **IEC61850** protocol without any protocol converter. Certificate from KEMA confirming interoperability, *Goose messaging & publishing as per IEC61850* standard shall be submitted along with the tender.

- Relays shall have one no. front RJ45 or USB port for Local Relay Parameterization and☐ **Two nos. rear FO port** for connectivity to SAS over IEC61850 protocol

- The relay shall have self-communication port monitoring feature and failure shall generate alarm. Relays shall have redundant power supply card i.e. in case of failure of one source fail, the redundant shall pick up instantly. Power supply card failure shall generate necessary alarm to local SCADA.

- The relay shall have sufficient battery back up to keep the internal clock running for atleast 2 years in absence of auxiliary supply

- Should have minimum 16 configurable LEDs

- Should have sufficient Binary Inputs and Binary Outputs as per scheme requirement including 30% BI & BO spare.

- All BI/BOs shall be site configurable

- Shall have front minimum 4 lines LCD display with Alpha numeric key pad

- Numerical relays are to be provided with built in Event / Disturbance / Fault Recorder features. The bidder shall bring out in the bid that the Numerical relays providing different protection features / application in a single unit if any one of the application/feature goes out of service the other feature/application (s) will remain un-effected.

- **The relays shall be site configurable (Including logic development)**

- Configured features & set values shall be in non volatile memory. Must have real time clock for time stamping of events/ disturbances with time synchronization inputs (GPRS etc.), Time synchronisation through SNTP & IRIG-B compatible.

- The relays should have self-diagnostic features identifying area of fault or failure of a particular component or card.

- Shall have in built Circuit Breaker Failure protection based on undercurrent detection and/or circuit breaker auxiliary contact status. Provision shall be given to initiate the breaker fail logic using a digital input from external protection devices.

- Hardware based measurement shall not be acceptable.

- The relay should have high immunity to electrical and electromagnetic interference. The same relay shall be provided with both 1A CT inputs and shall be site selectable.

- It shall be possible to energise the relay from either AC or DC auxiliary supply. *Auxiliary dc supply shall be suitable for both 110 and 220 Volt and* *shall be site selectable*.

- Be capable of performing basic instrumentation functions and displaying various instantaneous parameters like Voltage, current, active power, reactive power, phase sequence etc. in primary values. Additionally all sequence current and voltage values shall be displayed on-line. Also the direction of power flow shall be displayed.

- Extensive disturbance recording facility shall be available for at least up to 10 seconds to capture maximum possible information. Necessary software shall be provided for retrieving and analysing the records.

- Facility for developing customised logic schemes inside the relay based on Boolean logic gates and timers should be available. Facility for renaming the menu texts as required by operating staff at site should be provided.

4.3.13.3 **Must have additional feature of local breaker back up protection:-**
   a) The relay shall have built in Circuit Breaker Supervision Functions
   b) The relay shall be able to detect any discrepancy found between NO & NC contacts of breaker
   c) The relay shall monitor number of breaker trip operations
   d) The relay shall also monitor the breaker operating time.
   e) The relays shall have the following tools for fault diagnostics-

   - Fault record – The relay shall have the facility to store fault records with information on cause of trip, date, time, trip values of electrical parameters. Event record – The relay shall have the facility to store time stamped event records with 1ms resolution.
   - Disturbance records – The relay shall have capacity to store disturbance records of at least 10 sec. duration and sampling rate per cycle shall be more than 100.
   - It shall be possible to preserve stored information in the event of an auxiliary supply failure with the help of a battery backup.
   - The relay settings shall be provided with password protection.
   - It shall be possible to change the relay setting from the front panel using the key pads/ Work station of SAS and Laptop.

4.3.13.4 The relay shall have comprehensive self-diagnostic feature. This feature shall continuously monitor the healthiness of all the hardware and software elements of the relay. Any failure detected shall be annunciated through an output watchdog contact. The fault diagnosis information shall be displayed on the LCD. These records shall also be retrieved / retrievable from local as well as remote terminal through the communication port.

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4.3.13.5   The Numerical Relays shall be provided with 2 sets of common support software compatible with, Windows 7 which will allow easy settings of relays in addition to uploading of event, fault, disturbance records, and measurements. The relay settings shall also be change from local or remote using the same software.

4.3.13.6   The manufacturer shall have to provide up-graded support software if any within 10 years span.

4.3.14   INTEGRATED NUMERICAL TRANSFORMER PROTECTION RELAY

4.3.14.1   **General requirements**

a)   Shall be stable during magnetising inrush and over fluxing conditions. Stabilization under inrush conditions shall be based on the presence of second harmonic components in the differential currents.
b)   Shall have saturation discriminator as an additional safeguard for stability under through fault conditions.
c)   Shall have zero sequence current filtering, which may be deactivated separately for each winding, for special applications.
d)   Shall have software to take care of the angle & ratio correction of CT inputs.
e)   Shall have all output relays suitable for both signals and trip duties

4.3.14.2   **Functional Descriptions**

The integrated Numerical Transformer Protection Scheme shall have following functional qualities: -

a)   **Differential protection**
- The relay shall be biased differential protection with triple slope tripping characteristics with faulty phase identification / indication. The range for the differential pick-up shall be from 0.1 to 2.5 p.u. Its operating time shall not exceed 30 ms at 5 times rated current.

- The relay shall have two adjustable bias slopes from 20 % to 150 % and slope from 40% to 150 %, to provide maximum sensitivity for internal faults with high stability for through faults.

- The relay shall have an unrestrained high set element to back up the biased differential function and the setting range for it shall have a minimum setting of 5pu and a maximum setting of 30pu.

- The relay shall have the second harmonic restraint feature for stability under transformer inrush condition. The setting shall be 15-25%.

- Further, the fifth harmonic blocking for stability under transient over fluxing condition shall be provided.

b)   **Restricted Earth fault Protection**
- The scheme shall have in-built restricted earth Fault (REF) for both the windings. This function should be provided to maximise the sensitivity of the protection of earth faults.

- The REF function should be a high impedance element. The REF function should be able to share Current Transformers with the biased differential function. As in traditional REF protections, the function should respond only to the fundamental frequency component of the currents.

- For star/star transformer, both the windings shall be protected through REF, as such relay shall have sufficient analogue channels to accommodate the same.

c)   **Over fluxing Protection**
- The over fluxing protection shall be built in the relay. By pairs of v/f and t, it shall be possible to plot the over fluxing characteristics so that accurate adaptation of the power transformer data is ensured. In addition the relay should have a definite time element for alarm.

d)   **Thermal Overload Protection**
- Shall have two stages of thermal overload protection for alarm and trip condition with continuously adjustable setting range of 100-400% of rated current and time constant setting range of 1.0 to 1000.0 min continuously. Shall be single pole type.

- Shall have a drop off/pick up ratio greater than 95%

- Shall have separately adjustable time delay relays for alarm having a setting range of 1to 10 seconds continuously.

e) **Over Current Protection**
- The relay shall have three stages of definite time over current protection as backup operating with separate measuring systems for the evaluation of the three phase currents, the negative sequence current and the residual   current.

- In addition, the relay shall have three stages of Inverse time over current protection operating based on one measuring system each for the three phase currents, the negative sequence current and the residual current.

f) Shall have additional features to provide **under/ over voltage protection.**
g) Shall have additional features to provide **under frequency protection.**

4.3.15 OVER CURRENT AND EARTH FAULT RELAYS

4.3.15.1 These relays shall be of numeric, single/multi pole, directional /non-directional type with or without high set element as specified. These relays shall have the following features/characteristics: (i). IDMT characteristic with definite minimum time of 3 second at 10 times setting.

a) Other operating curves such as inverse, very inverse shall be selectable
b) Adjustable setting range of 50-200 % and 20-80% of rated current for over current and earth fault relays respectively.
c) The directional relays shall have a Maximum torque angle of 45° current leading for directional over current unit & 30 lag for directional earth fault. Other MTAs should be settable
d) Voltage polarizing coil: 63.5 or 110 volt
e) Must have faulty phase, type of fault identification
f) The directional relays shall have over voltage/ under voltage & under frequency built in protection.
g) The relay shall have blocking scheme on Reverse Power Flow.
h) Shall be draw out type
i) Shall have additional features to provide **under/ over voltage protection.**
j) Shall have additional features to provide **under frequency protection.**

4.3.16 TRIP CIRCUIT SUPERVISION RELAY

- The relay shall be capable of monitoring the healthiness of each 'phase' trip-coil and associated circuit of circuit breaker during 'ON' and 'OFF' conditions.

- The relay shall have adequate contacts for providing connection to alarm and event logger.

- The relay shall have time delay on drop-off of not less than 200 milli seconds and be provided with operation indications for each phase.

4.3.17 MASTER TRIP RELAY

- High Speed Tripping Relay shall be instantaneous (operating time not to exceed 10 milli-seconds) The relays shall reset within 20 milli seconds

- The relay shall be re-settable/configurable from local SCADA.

- The relays shall be D.C. operated

- The relays shall have adequate contacts to meet the requirement of scheme, other functions like auto-reclose relay, LBB relay as well as cater to associated equipment like event logger, Disturbance recorder, fault Locator, etc

- The relays shall be provided with operation indicators for each element/coil.

4.3.18 OTHER TRIP RELAYS

- For transformer protection other trip relays for Buchholz, winding & oil temperature high, PRD etc. shall be provided as per requirement.

- These High Speed Tripping Relays shall be instantaneous (operating time not to exceed 10 milli-seconds The relays shall have adequate contacts to meet the requirement of scheme

4.3.19 DC SUPPLY SUPERVISION RELAY

- The relay shall be capable of monitoring the failure of D.C. supply to which, it is connected. It shall have adequate potential free contacts to meet the scheme requirement.

- The relay shall have a 'time delay on drop-off' of not less than 100 milli seconds and The relays shall be provided with operation indicator/flag.

4.3.20 .PROTECTION SCHEME FOR PANELS 33 KV FEEDER PROTECTION PANEL

- The 33 kV Feeder Panels shall be provided non directional single/ multi pole relays as specified

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- One triple pole over current relays for phase faults and one Earth Fault Relay for Earth Faults with high set elements shall be provided.

4.3.21   POWER AND AUTO TRANSFORMER PROTECTION PANEL

4.3.21.1 The following protections scheme shall be provided for Panels for all Power and Auto Transformers:

- **Main Protection**
  Biased transformer differential protection employing relay type specified. As overall protection scheme for transformers following features of the Numerical Relay shall be employed:

  i)   Restricted Earth Fault Protection.
  ii) Over-fluxing protection
  iii) Under Frequency and Over Voltage Protection

- **Backup Protection**
  The backup protection shall be provided with non-directional relays as specified. One triple pole over current relays for phase faults and one Earth Fault Relay for Earth Faults with high set elements shall be provided. The high set unit should not operate due to transformer in-rush current.

4.3.22   SWITCHES

- Control and instrument switches shall be rotary operated type with plates clearly marked to show operating position and circuit designation plates and suitable for flush mounting with only switch front plate and operating handle projecting out. Handles of different shapes and suitable inscriptions on switches shall be provided as on switch identification

- The selection of operating handles for the different types of switches shall be as follows:-

  i)   Breaker and isolator - Pistol grip, black control switches.
  ii) Synchronizing switches-Oval; black, keyed handle.
  iii) Selector switches - Oval or knob; black
  iv) Instrument switches - Round, Knurled, black.
  v)   Protection transfer - Pistol grip; lockable and black switch.

- The control switch of breaker and isolator shall be of spring return to neutral type.

- Instrument selection switches shall be of maintained contact (stay put) type. Ammeter selector switches shall have make before type contacts so as to prevent open circuit of CT secondary when changing the position of the switch.

- Synchronising switches shall be of maintained contact type having a common removable handle for a group of switches. The handle shall be removable only in the OFF position and it shall be arranged to the 'ON' position. One contact of each switch shall be connected in the closing circuit of the respective breaker so that the breaker cannot be closed until the switch is turned to the 'ON' position.

- The contacts of all switches shall preferably open and close with snap action. Contacts of switches shall be with coated with pure silver. Spring shall not be used as current carrying parts.

4.3.23   TESTS

- The supplier shall carryout all tests as per relevant standards as all associated equipment including relays, meters, instruments etc. The supplier shall submit all that reports to Employer for approval before despatching the control and relay panels. The Bidder shall also submit along with the bid type test reports for relays instruments, meters and other devices of the type and class being offered. Bidder has to submit KEMA test certificate for Numeric relay on interoperability compliance of IEC 61850 in general and GOOSE messaging and publishing in particular along with the bid.

- Control and relay panels shall be subjected to the following tests:

  i)   Mechanical operation test.
  ii) Verification of degree of protection.
  iii) High voltage test (2000 volts for 1 minute)
  iv) Electrical control interlock and sequential operation test.
  v)   Verification of wiring as per approved schematic.
  vi) Interoperability test as per IEC 61850 (interoperability with ABB, AREVA, SIEMENS, GE and SEL)

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4.3.24 PRE-COMMISSIONING TESTS

4.3.24.1 The contractor shall have to perform following minimum Pre-commissioning tests, as applicable, for commissioning of the C&R panels. For this purpose, the contractor shall arrange all required tools and testing equipment at site.

a) IR values of all circuits.

b) Measurement of burden in CT & PT circuits.

c) Primary current injection of CT circuits with connected burden

d) Energisation of PTs at suitable low voltage and measurement of PT inputs at all measuring points

e) Secondary ac current injection of relays, dynamic testing of all numeric relays. Tracing of zone curves, limits. Checking of relay timings, inherent or set values. For this testing, the contractor shall bring 'Omicron' or equivalent test kit.

f) Testing of voltage related elements like directional element, over fluxing, over/ under frequency, over/ under voltage features, tracing of curves and checking limits of set values and associated timings (vii). Checking of Boolean logic gates, BI/BO points of the numeric relays, checking conformity to specification and checking of set logics

g) Checking of stability and sensitivity of differential zones by suitably applying 3-phase low voltages and shorting of primary circuits. Measurements of voltage and current inputs to all relays.

h) Checking stability & sensitivity of bus differential relay zones by suitably injecting current

i) Primary injection of REF connected CTs, measurements of relay inputs and checking of stability and sensitivity of REF scheme

j) Checking registration of event and disturbance records in the numeric relays and downloading (xii). Testing of carrier aided protection schemes and simulation with regard to transmission and receipt of protection signalling

k) Testing of AR schemes.

l) Checking of healthiness of each dc circuit of panels

m) Simulation of faults like Buchholz, OTI, WTI and other relays and checking of tripping of breaker and connected annunciation

n) Operation of master trip relays, tripping of breaker through each trip coil and checking of inter locks

o) Simulation of faults like low gas, air pressure and checking operation of inter locks. Checking anti umping scheme of CB.

p) Simulation to Check Checking of PT selection schemes.

q) Simulation to Check interlocks of all CB and isolator inter locks

r) Simulation to Check annunciation of all events in BCU (Bay control unit) as well as SAS (Substation automation System)

s) Simulation to Check of logic of BCU.

t) Operation of tap changing of transformer through SAS

4.3.25   TECHNICAL DATA SHEET FOR THE RELAY AND CONTROL PANELS

4.3.25.1   Features to be provided in various Relay and Control panels are indicated below.

Description below are only indicative; the Contractor shall ensure that all items are included in their off to complete the schemes described in the Specification whether such items are specifically mentioned or not.

SL NO	Item	Ratings & particulars
1	**Protection and Relays**	
	a) Back up directional over current and earth fault scheme	1 set
	b) LBB protection Scheme.	Can be function of BCU/IED's
	c) Trip Circuit supervision Relay for pre and post closing	Supervision for 02 trip coils
	d) DC Supply healthy monitoring scheme	2 No
	e) AC Supply healthy monitoring scheme	1 No
	f) High Speed Trip relay	2 Nos.
	g) DC Supply changeover relay	1 No
	h) LBB trip relay	2 Nos.
	g) Auxiliary relay(CB Control relay) timer relay for healthiness of relays, trip transfer, auto reclose communication link etc. As required	As required (Can be function of BCU)
	h) Bus PT selection scheme	1 No
2	**Control/Status indication/annunciation**	
	a) Bay Control Unit (IED with HMI)	1 No (Function of BCU/SAS)
	b) Ethernet switch for connecting to existing ring LAN of SAS	1 No

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SECTION – 5

BID SUBMISSION SHEET, BID FORMS AND SCHEDULES

1. Bid Submission Sheet

(To be submitted in Bidder's Letterhead)

Name of contract:

To,

        The Deputy General Manager,
        Lower Assam, T&T Circle, AEGCL,
        Narengi.Guwahati-26

Sir:

We have examined the General Conditions of Contract, Technical Specification, Schedules, and Addenda Nos _____(if any). We have understood and checked these documents and have not found any errors in them. We accordingly offer to execute and complete the said Works and remedy any defects fit for purpose in conformity with these documents and the enclosed Proposal (Price Offer)

We accept your suggestions for the appointment of the Dispute Adjudication Board, as set out in the Bidding Document.

We agree to abide by this Bid until _____ and it shall remain binding upon us and may be accepted at any time before that date.

If our bid is accepted, we will provide the specified performance security, commence the Works as soon as reasonably possible after receiving the notice to commence, and complete the Works in accordance with the above-named documents within the time stated in the Bidding Document.

Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.

We understand that you are not bound to accept the lowest or any bid you may receive.

Commissions or gratuities, if any, paid or to be paid by us to agents relating to this Bid, and to contract execution if we are awarded the contract, are listed below:

Yours faithfully

Signature _____ in the capacity of _____ duly authorized to sign bids for and on behalf of _____

Address

_____

_____

        Bidder's Signature & Seal

2.Form-BG

Form of Bid Security (Bank Guarantee)

WHEREAS, _____ *[Name of Bidder]* (hereinafter called "the Bidder") has submitted his bid dated _____ *[Date]* for the construction of _____ *[Name of Contract]* (hereinafter called "the Bid").

KNOW ALL MEN by these presents that We _____ *[Name of Bank]* of _____ *[Name of Country]* having our registered office at _____ (hereinafter called "the Bank) are bound unto _____ *[Name of Employer]* (hereinafter called "the Employer") in the sum of _____for which payment will and truly to be made to the said Employer the Bank binds himself, his successors and assigns by these presents. SEALED with the Common Seal of the said Bank this ___ day of_____ 20___.

THE CONDITIONS of this obligation are:

    (1)   If the bidder withdraws his Bid during the period of bid validity specified in the Form of Bid:
Or

    (2)   If the Bidder refuses to accept the correction of errors in his Bid;

Or

    (3)   if the Bidder, having been notified of the acceptance of his Bid by the Employer during the period of Bid validity;

        (a)   fails or refuses to execute the Form of Contract Agreement in accordance with the Instructions to Bidders, if required; or

        (b)   fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders;

we undertake to pay to the Employer up to the above amount upon receipt of its first written demand, without the Employer having to substantiate its demand, provided that in its demand the Employer will note that the amount claimed by it is due to it owing to the occurrence of one or all of the three conditions, specifying the occurred condition or conditions.
This Guarantee will remain in force up to and including the date 180 days after the deadline for submission of bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

DATE _____   SIGNATURE   OF   THE   BANK   _____

WITNESS _____   SEAL   _____

(Signature, Name, and Address)

3.Form-MA
Form of Manufacturer's Authorization
(To be submitted in Manufacturer's Letterhead)

Bid No.:

To,

      The Deputy General Manager,
      Lower Assam, T&T Circle, AEGCL,
      Narengi.Guwahati-26

WE *[insert: **name of Manufacturer**]* who are established and reputable manufacturers of *[insert: **name and/or description of the Goods**]* having production facilities at *[insert: **address of factory**]* do hereby authorize *[insert: **name & address of Bidder**]* (hereinafter, the "Bidder") to submit a bid the purpose of which is to provide the following goods, manufactured by us, and to subsequently negotiate and sign the Contract:

1.   -------------------------------------

2.   -------------------------------------

We hereby extend our full guarantee and warranty in accordance with **Clause 2.9.0** of the Special Conditions of Contract, for the above specified Goods supporting the Supply of specified Goods and fulfilling the Related Services by the Bidder against this Bidding Documents, and duly authorize said Bidder to act on our behalf in fulfilling these guarantee and warranty obligations. We also hereby declare that, we will furnish the Performance Guarantee in accordance with **SCC Clause 2.6.0.**

Further, we also hereby declare that we and, *[insert: **name of the Bidder**]* have entered into a formal relationship in which, during the duration of the Contract (**including related services and warranty / defects liability**) we, the Manufacturer or Producer, will make our technical and engineering staff fully available to the technical and engineering staff of the successful Bidder to assist that Bidder, on a reasonable and best effort basis, in the performance of all its obligations to the Purchaser under the Contract.

For and on behalf of the Manufacturer

Common Seal and Signature of the authorised person: Name:

Designation:

NOTE:
This MA should be signed by a person having either of the following-

1) Valid Power of attorney
2) Authorised by Managing Director
3) Member of Board of Directors

            Bidder's Signature & Seal

4.Guarantee Declaration

We declare that the ratings, specifications and performance figures of the various plants and equipments /material furnished by us in the Bid are guaranteed. We further declare that in the event of any deficiencies in meeting the guarantees in respect of the characteristics mentioned in Guaranteed Technical Particulars, of Technical Bid as established after conducting the factory test, you may at your discretion, reject or accept the equipment/material after assessing the liquidated damages as specified in relevant clause of Bid Document.

Date: (Signature)...

Place: (Printed Name)...

(Designation)...

(Common Seal)...